ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXLI. No. 3642 SEPTEMBER 12, 1947 9d. WEEKLY

Assurances Needed

Confidence in Supply Industry's Future

WITH the setting up of the British Electricity Authority several leaders of the electricity supply industry know what their future roles are to be. But there remain many others whose destinies are unsettled and this applies more particularly to the thousands of junior technical and commercial officers.

It is inevitable that during the taking-over period which must occupy the next two or three years at least, this state of uncertainty must continue. But it is bad both for the men and women concerned and for the industry and the country and anything which can be done to assure them that their future is as secure as anybody can predict in these unsettled times should be done as quickly as possible.

First of all we need a clear statement of policy from the British Electricity Authority. This should not be difficult, for we have the best grounds for believing that that policy will preserve the industry's reputation of good service if the new organization is not trammelled by the higher authorities in Whitehall or bemused by the lower authorities all over the country.

Recognition of Ability

What we want to hear is that the Authority regards electricity supply as a progressive business enterprise to be run on businesslike lines and not a kind of indirect branch of the Civil Service, however admirable certain qualities of that Service may be. This requires that full scope shall be given to individual talent and ingenuity; ability, whether in the most responsible positions or in the less prominent strata of the organization, must be fully recognized. Seniority, while being given its due weight, should not be the sole consideration in deciding upon promotions, and freedom of movement between Areas should be secured to offer ability the widest possible range. The large measure of Area Board autonomy which is generally considered desirable must not be allowed to lead to restriction upon movement of individuals anxious to better themselves and in doing so make the service a really dynamic one.

Status and Prospects

Encouragement and hope are sought by the staffs of the electricity supply undertakings. They should be assured that in the publicly-owned service appropriate positions will be found for most of them not inferior in status or salary to those which they now hold, with equal, or even improved, prospects of promotion.

Future long-range policy will be the concern of all members of the Boards and these have not yet been appointed, but it seems to us that the Central Authority is competent to make a general statement on the lines we have indicated without being accused of tying the hands of the Boards. By assuring the public that their future electricity supply is to be as good as, or better than, the existing service and that they will still be dealing with human beings and not with a State machine the Authority will invite goodwill from the start. And by giving the industry's personnel some guarantee for the future it will ensure that "consumer

relations" will remain unbroken and that the transition from the old arrangements to the new will be smooth.

Sir John Kennedy's Appointment

ALTHOUGH the Electricity Commission is presumably to be dissolved when the British Electricity Authority gets into its stride, it is evident that a great deal remains for it to do in the handing-over process and its dissolution will not be immediate. This is indicated by the appointment of Sir John Kennedy as chairman of the Commission after acting as deputy-chairman for a number of years and as a Commissioner since 1934. Much the same considerations apply in the case of the Central Electricity Board of which Sir Johnstone Wright recently became chairman, in succession to Mr. Harold Hobson. We think it is the general hope that the experience of Sir John Kennedy and Sir Johnstone Wright will not be lost to the electricity supply industry when their organizations are taken over.

Fuel Problems

DEFICIENCY of fuel throughout the world is unlikely to be merely a passing crisis. Though no immediate alleviation is to be expected as a result of the fuel economy meeting of the World Power Conference (reported on page 407), its proceedings did much to encourage the hope that the exponentially increasing demand each year for electricity will ultimately be met. For many years reliance for improvement will have to be placed on development of methods that are either existing or now to be seen only as prototypes, and these will have to be exploited to the full. The economic use of atomic energy for power production on a large scale, even were political obstacles cleared out of the way, presents technical problems that are not yet within sight of solution.

Water Shortage

COAL shortage in Great Britain is an unprecedented trouble, but risk of curtailment of electricity supplies owing to drought is recurrent in many countries which depend wholly or in part on water power. Now even Sweden, normally so happily situated in this way, has been forced to introduce rationing. During the coming winter (until the spring rains ease matters) the amount of electricity available to industry will be a percentage of that taken in 1946, and the use of neon signs and domestic water heating and space heating is also to be restricted.

Small Waterfalls

THERE are said to be 30,000 small waterfalls in France that are capable of providing power. Most of those already harnessed (the proportion is unknown) serve some local industry but are not exploited to the full extent. It is believed that the existing barrages would usually be adequate for the purpose and that additional turbo-sets only would be required to feed the balance into the general supply network. The possibilities are to be examined by appropriate organizations, but, attractive as these may seem, experience elsewhere suggests that the electricity thus produced would not as a rule compare advantageously on an economic basis with that generated by oil, always provided the latter is obtainable.

Public Economy

THE Ministry of Fuel and Power has reminded the public that the industrial load-spreading scheme does not involve a one-third reduction in electricity supply consumption by industry. There is bound to be some confusion in the public mind in this matter and it is essential that it should be made clear that the coal saving which is still necessary must be achieved largely in the home, the office and the shop. Educational campaigns are now being conducted in a number of towns and upon a public inured to "austerity" they should have some effect. With insufficient plant and less and dearer coal shall we ever regain "cheap and abundant" supply which we had managed to secure before the war?

Contractors' Gatherings

MEMBERS of the Electrical Contractors' Association have had little opportunity of getting together as a body since the war put an end to the E.C.A.'s annual conference in the summer and dinner in the winter. Consequently they will be glad to learn (as we are) that both events are being revived next year if, it is to be presumed, circumstances permit. As regards the conference a correspondent tells us that the Bournemouth authorities are extending an invitation to the Association to hold this function there next June.

Crane Reconditioning

Large Hammerhead Crane with Modern Controls

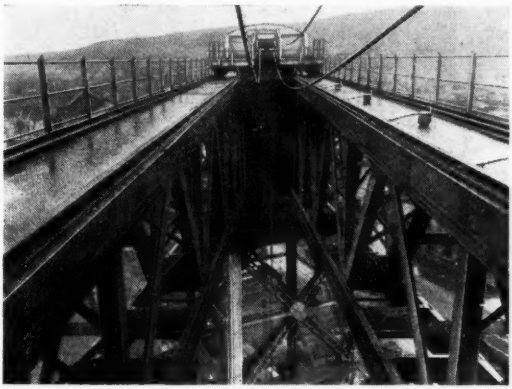
The 150-ton cantilever crane at the James Watt Dock of the Greenock Harbour Trust

THE following is a description of how a 150-ton cantilever fitting-out crane, built by Sir William Arrol & Co., Ltd., in 1917, was modernized electrically during the war, at a time when the requirements of the shipbuilding and ship repair industries made it imperative for the crane to work continuously. This crane has the greatest lifting capacity in the lower reaches of the Clyde and consequently is a vital link in the fitting-out of all classes of ships.

After a ship has been launched at one of the shipyards with the usual ceremony, it is towed to its berth below the crane so that the heavy machinery and other major items may be fitted. It was for this purpose the crane was built. The equipment to be placed in the ship is usually lying in readiness, arranged in a definite order within the radius of the crane. The tonnage handled by the crane for a ship of 4,000 net registered tons is approximately 550 and it usually requires three to four weeks to complete the vessel ready for trials.

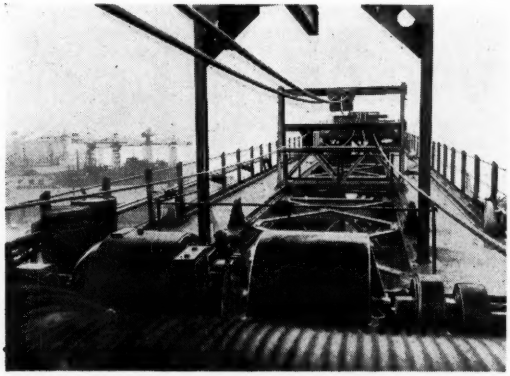
The new control gear was designed and manufactured by the Igranic Electric Co., Ltd., and incorporated in the crane by the Greenock Harbour Trust's staff by degrees while the crane was in commission, without retarding its normal work in any way.

The crane consists of a fixed square latticed tower surmounted by a horizontal jib of unequal arms, counter-weighted at the end of the short arm. The long arm measures 140 ft from the centre of the tower to the extreme end of the jib and the short arm measures 80 ft. The weight of the double cantilever and the loads which it carries is supported on a ring of tapered rollers 35 ft in mean diameter at the top of the tower. The electrically propelled travelling trolley is carried on four heavy steel rails on the top of the long arm of the jib. The rails are 153 ft 6 in. from ground level. The main



View of crane from extreme end of the long arm of the jib. Depth of twin box latticed girders approximately 26 ft at tower tapering towards end of jib ; radius switches on right-hand platform

trolley frame is carried on four bogies each having four wheels. The trolley is constructed so that the loads are equally distributed over the sixteen wheels. Robust limit switches are fitted to the hoisting and racking motions and the operation of any limit switch only affects the motion in that particular direction. The crane is capable of lifting, revolving and traversing loads up to 150 tons at suitable radii.



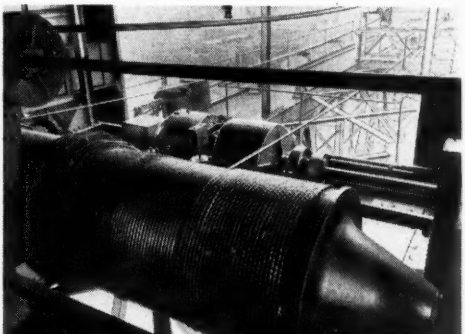
View of jib from machinery house ; foreground, auxiliary hoist winding drum, with the grooves exposed

Five similar 50-h.p., 450 r.p.m. series-wound d.c. motors do the work of the crane. Change gear facilities are provided in all four motions, namely, auxiliary hoisting for loads up to 30 tons, main hoisting for loads from 30 to 150 tons, racking and slewing.

To accommodate the new control gear the existing slewing house was extended 27 ft and the control panels were grouped on each side of the centre-pin. The various resistance banks associated with the new gear were in turn grouped around the exterior of the new contactor house, the idea being to preserve the balance fore and aft of the centre-pin. The house was kept as low as possible to avoid any effect on the slewing from wind pressure. The total weight of the control panels and resistances amounts to 5 tons and about 3,000 yd of weatherproof cable of various types has been installed. A special feature of the control cabin is the close proximity of the driver to the look-out window and the grouping of the controls around him.

The supply is by an independent feeder from the public mains at 500/250 V d.c. to a switch-fuse assembly at the base of the crane, and thence by heavy gauge tubing to the sliprings in the centre of the contactor house. The supply is collected by large carbon brushes and conveyed by cables to the incoming 500-A d.p. isolator and neutral link. Three contactors below, two large and one small, are directly connected to the isolator and form a means of easily disconnecting or connecting the supply to the motors or control circuits remotely by the driver or locally for testing purposes. Busbars run the full length of both control panels and supply individual sections for the different motions of the crane.

As the motors are all of 50 h.p. and of identical construction, the general aspect of the control panel is one of precise uniformity. The control gear comprises master controllers and automatic contactor panels with various push-buttons and auxiliary apparatus. The main resistances are of the Rheostatic Company's special rustless unbreakable construction. The sequence and timing of the contactors is supervized by the Igranic inductive time-limit system, which operates without relays, clockwork mechanisms or

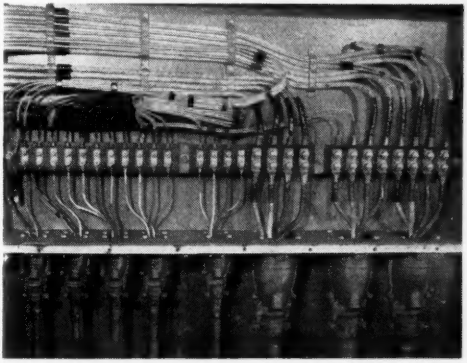


Auxiliary hoisting gear : winding drum in foreground

dash-pots, so that the driver is left with only one care, namely, the proper handling of his load.

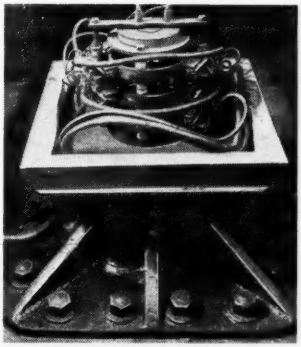
The plugging and accelerating contactors which regulate the speed of the motors have, in addition to the usual shunt closing coil, a second shunt holding-out coil which acts on the tail-piece of the armature. The air-gap of the magnetic circuit for the holding-out coil is adjustable to suit operating conditions. The adjustment is easily made and the resultant setting is permanent.

Below the auxiliary hoist panel is a box which protects a number of shunt coils mounted on



Junction of machinery and contactor house cables; this box (Johnson & Phillips) is in the contactor house; a similar box is fitted in the machinery house

a common core to form a mutual inductance. Each accelerator holding-out coil has one of these inductance coils in series with it; a source of voltage is obtained for each pair of holding and inductance coils by tapping it across a suitable part of the main motor resistance. Thus, at the instant of first closing the motor circuit, all holding coils are energized by transient currents and the rate of closure of the accelerating contactors is limited by the system of timing thus instituted. If therefore a sudden change of speed is instigated at the master control handle the contactor gear obediently follows but not in too great haste.



Exposed view of sliprings; this is the collector column by which energy is passed from the stationary to the moving structure

The Igranic ITL control imposes the following limits:— (*a*) A rapid maximum acceleration of the light hook to full speed in 2 sec; (*b*) a moderate acceleration of full load hoisting in 2½ sec; (*c*) a moderate acceleration of either light hook or full load from rest to full speed lowering in 3 sec; (*d*) a rapid deceleration when lowering from full speed to creeping in about 1½ to 2½ sec with light hook and full load respectively; (*e*) an extended time of about 5 sec if the control is by chance reversed from full speed lower to full speed hoist whilst there is a heavy load on the hook; and (*f*) a full graduated system of dynamic braking in six successive steps taking place in from 2 to 3 sec when the motor

Complete contactor switchboard. Order of panels, foreground to background: Slewing, auxiliary hoist, incoming, main hoist, racking

is being stopped after lowering at full speed.

The auxiliary hoisting motion is operated by a master drum with five steps hoisting and six steps lowering. The first three steps of hoisting have in addition a slow speed armature diverter control which can be switched on and off by the driver. To prevent flashing at the commutator the diverter steps have been rendered foolproof by the installation of a centrifugal switch directly coupled to the armature shaft. This prevents the driver from using the diverter resistance if the speed of the armature is too high. The lowering motion is by potentiometer control with automatic dynamic braking. Lowering speeds up to 200 per cent of motor rated speed are possible with this equipment but somewhat lower maxima were chosen when setting this installation. A device is incorporated which ensures that heavy loads are not lowered too fast by automatically reducing speed from sixth to fifth step conditions.

The main hoist equipment is accommodated on two panels adjacent to the incoming panel and is similar in most respects to the auxiliary panel. In this instance the contactors are double pole as two 50 h.p. motors in tandem constitute the drive. Control facilities are provided to run either motor singly should the necessity occur. There are five steps for hoisting and five for lowering on the master switch, whilst a push-button gives one special creeping speed when hoisting a light load, of say, 20 tons on the main blocks. It is sometimes necessary to use the main blocks for loads below 30 tons in order to accommodate the various tackles used in balancing a special load.

Inside the control cabin

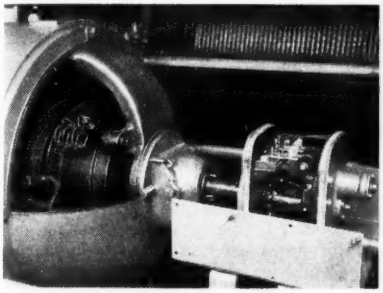
The master drum which controls the slewing panel has only four running positions but the contactors provide six steps of acceleration thus ensuring smooth movement. The racking panel adjacent to the main hoist panel is similar in most respects to the slewing panel with the addition of four steps of low speed diverter control, i.e., the driver has the choice of eight different speeds which is ample for the efficient handling of any load up to 150 tons.

Mounted on the left-hand control desk in the control cabin are a telephone to the checker's office at ground level; switch-fuse boxes for the main lighting and heating of the cabin; a voltmeter; a main hoist controller; self-locking "on" and "off" push-buttons (main supply); four indicating lights for mains, limits and brakes; a large wheel for the control of the main hoist emergency oil brake; "on" and "off" buttons for main and auxiliary hoist creeping as described above; and two switch sockets and s.p. switches for the control of heating and nightwork lighting.

On the right-hand control desk are the racking controller; the slewing controller; "on" and "off" push-buttons for the hoist limit bridging device for special work; self-locking "on" and "off" push buttons for the control-circuit-isolating contactor; indicating light for the control supply; and "on" and "off" push-buttons for the racking slow motion. At the left-hand side of the window are an oil pressure gauge for the emergency brake; a slow-motion indicator connected electrically to the main hoist motor shaft; and a tachometer which registers up to 1,200 r.p.m. in parallel with the slow motion indicator. On the right of the window are a radius light indicator and a driving mirror.

In most cranes of this type an oil brake is used when lowering heavy loads, but in this instance it is used only in an emergency. An oil pump is connected to the main gearing by a free-wheel device which can transmit power only when lowering. The pump circulates oil round a pipe line, a valve in which, operated by the driver's wheel, can control the load. The sudden application of this valve can create a high pressure and

this necessitates the use of a pressure gauge. The Record slow motion indicator gives the driver visual indication that the main hoist machinery is in motion. Motor speeds as low as 10 r.p.m., i.e., 0·195 ft per min (fast gear) and 0·132 ft per min (slow gear) at the block are obtainable under certain conditions.



Centrifugal switch coupled to auxiliary hoist motor. Only one pair of contacts is used; the switch is mounted on ball bearings and is of rugged construction. At the motor the brush lead has been removed to give a better view of the commutator

The radius indicator is a series of coloured lights which are switched on and off by the trolley as it travels back and forward on the jib. The switches controlling these lights are fixed on the jib at specified distances from the centre-pin, enabling the driver to manipulate the loads with safety. By clamping a split pulley to the driving shaft of the auxiliary hoist gear and painting white straps across the periphery, it is possible on this crane to see a reflection of the pulley in the small mirror beside the driver. The driver has by this means visual indication of movement when using creeping speeds, and by means of a spot light this device can be used at night.

The modernization of the electrical devices has improved the manipulation of the crane to a marked degree and the maintenance outlay has been negligible since the new installation was completed. A delicate operation carried out by the crane after the completion of the new control gear was slipping the stator over the rotor of a 6,000-h.p. marine motor. The stator weighed 28 tons and the rotor 33 tons and the clearance between them was 6 mm. The job was completed in a few hours; normally it would have taken days had lifting jacks been used. Though the crane can lift 150 tons in one operation the normal demand is for a large number of lifts of a few tons. The auxiliary hoist motor is therefore kept constantly at work and the commutator of this machine is illustrated after four years operation with the new control.

We are indebted to the Greenock Harbour Trust for permission to inspect the crane and to publish this description and to Mr. William C. Morrison, A.M.I.E.E., chief electrical engineer, for co-operation in the preparation of this article.

Electron Jubilee

A SERIES of lectures and commemorative functions are to take place in London (September 25th–26th) in celebration of the jubilee of the discovery of the electron by the late Sir Joseph John Thomson, O.M., M.A., F.R.S., Hon.M.I.E.E. and Faraday Medallist, during his professorship at Cambridge University.

The celebration is being arranged by the Institute of Physics and the Physical Society in collaboration with the Institution of Electrical Engineers, for whose members four special lectures are to be delivered. It is understood that lecture meetings will also take place at various centres in the Dominions to mark the event.

Sir Clifford Paterson will address a lay audience on "The Electron Liberated" in the Central Hall, Westminster, at 7.30 p.m. on September 25th; admission by ticket only, obtainable (sending stamped and addressed envelope) from the Institute of Physics, 47, Belgrave Square, London, S.W.1.

Industrial organizations and universities are collaborating in the organization of a special exhibition in the Science Museum at South Kensington (to include some of Thomson's original apparatus) designed to indicate the principles underlying many electronic devices and help the visiting public to appreciate the important parts these developments are playing in daily activities. A handbook has been compiled by Mr. D. H. Follett (of the Museum, price 1s., or 1s. 2d. post free from the Institute of Physics) as a guide to, and general account of, the subjects represented in the several sections of the exhibition, which will be formally opened on September 26th and thereafter remain open to the public for three months.

Electricity Rationing in Sweden.—Because of the prolonged drought this summer the Swedish Fuel Commission is to restrict private consumers to the average consumption during the past year. Certain types of advertising signs are banned during fixed hours.—*Reuter.*

Views on the News

Reflections on Current Topics

SOME extravagant statements have recently appeared in the press regarding the electrical consumption of cinemas. Commenting on this at a meeting of the North Western Branch of the Cinematographers' Association held at Liverpool, Mr. J. V. Robinson said one newspaper stated that a cinema used 700 kWh a day. He supervised twenty-five theatres and the average was less than 850 kWh a week. The largest theatre seating 2,600 and including a café, open from 1 p.m. to 11 p.m., used only 1,424 kWh a week. Even if the high figure quoted by the newspaper were correct, from the fuel economy point of view it is probable that on balance less fuel would be used, in winter at any rate, if the cinema remained open than if it were closed. This may sound paradoxical and is a point that I have never seen stressed before. Yet cinema-goers may easily save in their homes by not using fuel, lighting, radio, etc., far more electricity (or its equivalent in other forms of fuel) than is consumed by the cinema.

* * *

A method of measuring high temperatures that is new to me is reported in *Power*. Other methods of ascertaining the degrees reached by gas-turbine rotors having failed, the idea was hit upon of making certain parts of a special alloy which changes colour for every 25 deg between 500 and 700 deg C. It then reverts to the original colour and repeats the colour scale from 725 to 900 deg.

* * *

The flexible cords are the one drawback of electric irons. Even if means can be found for keeping them out of the working area it is to them that can be traced the majority of failures of the apparatus. It is therefore interesting to see that some cordless models are now appearing on the market, generally sold as a component of an ironing board with special socket. The idea of a cordless iron is of course by no means new. Apart from the fact that heat is lost all the time the iron is in use and the desired constant temperature is therefore unobtainable, the principal objection to it, is that, however simple the plug-socket arrangement may be, there is always a certain amount of effort required to connect up the iron during the intervals between ironing operations. This disadvantage seems, however, to have been overcome in a model I have just been reading about in an Australian journal. When the iron is placed on its stand it runs back on twin rollers and automatically plugs itself in, a built-in switch guarding against danger.

* * *

Scottish persistency prevailed in the matter of the floodlighting of Edinburgh Castle during the Festival. After refusing permission the Ministry of Fuel and Power had to succumb to the flood of protests from irate Scots and grudgingly conceded four nights' illumination. Circumstances will be altered by the load staggering arrangements which begin on October 1st, but hitherto the Ministry has shown a lamentable lack of appreciation of the innocent human desire for more light. Last winter, for instance, our spirits could have been raised appreciably by better night-time illumination and weighed against the small amount of extra fuel involved this should have been allowed. Likewise a little floodlighting on special occasions is a justifiable extravagance.

The amount of energy required for lighting up Edinburgh Castle is insignificant against the lavish use of electricity in Moscow for the celebration of the city's 800th birthday. According to *Reuter* "a hundred million electric light bulbs decorate the buildings, squares, parks and ships on Moscow river—100,000 of them alone outlining the walls, towers and spires of the Kremlin." Enough, in fact, to break Mr. Shinwell's heart.

* * *

There have been mysterious happenings in the Argentine telephone industry. Recently, by Government decree, the entire board of the *Empresa Mixta Telefonica Argentina* was removed from office. Now, in a Buenos Aires journal, I read of the "long list of nefarious deeds and crooked dealings with which the former president and sub-manager have been charged." The report goes on to say that "the culpable persons wasted not a moment in getting down to their illegal practices, without ever going through the motions of managing the concern honestly for a discreet period." I rather like the heading "Phoney Business."—**REFLECTOR.**

Electrical Spares

Requirements in Factories

By F. G. Marshall, A.M.I.E.E.

THE question of the numbers and types of spare motors, armatures, rotors and other electrical apparatus that should be provided in any factory is intimately connected with the degree of standardization of equipment that has been carried out there during the last ten or twenty years. If the factory is large and the type of machinery such that intense standardization is readily applicable, then the problem is very much simplified. In the vast majority of cases, however, such favourable conditions are not in evidence, and the very large number of motors of different manufacture, horse power, speed and type makes the problem of deciding upon the number of spares to be kept available, to avoid loss of production due to breakdowns, a very real one.

In many instances complete motor units are preferably kept as spares, but in factories where most of the motors are of one make, it is often found more economical to have a large number of spare armatures and rotors instead.

Review of Stock Position

The factory engineer, responsible for general maintenance and for keeping the machinery in operation with the minimum of interference with production, naturally wishes to keep a large stock of spares available for all possible eventualities. These, however, represent capital locked up and, unless care is taken to maintain the stock of spares in good condition, it will deteriorate and become more of a liability than an asset. Thus, in course of time, factory executives may entertain an entirely false idea regarding security from delays from failure of electrical equipment. The position must therefore continually be examined by the maintenance engineer and works manager in close collaboration.

It is not necessarily the motor that is running almost continuously that will be the first to fail. The motor that is operated only occasionally, but is just as important to factory output, is liable to develop trouble at times, especially if it has been standing for long periods in a damp atmosphere. When it does fail, it is likely that it will give no previous warning, as it probably would if it were running continuously on load. Special consideration should therefore be given to spare equipment required for emergency and little-used machinery.

The chief engineer and works manager have to strike a balance between the damaging effect on general production of a prolonged breakdown of each motor, if no spares are available, and the cost of a spare unit. They must also give special consideration to cases where one spare motor will act as a standby for a number of individual drives, and this often gives ample reason for the provision of otherwise unjustifiable spares.

Interchangeability of Motors

The judicious use of special adaptor plates will make motors of different manufacture interchangeable, providing that the speeds are similar and the horse-powers are approximately the same. These adaptor plates satisfactorily surmount the difficulty of varying positions of holding down bolts, but their use is dependent upon no difficulty arising with regard to shaft height above the base plate.

In deciding whether or not a spare for a heavy drive should be purchased, the engineer should bring to the discussion details of the physical conditions under which the motor operates, e.g., whether heavily or lightly loaded and whether operated in a wet or dry atmosphere. As an example, a very lightly loaded and intermittently operated motor, situated in a damp atmosphere, may never have an opportunity of warming up sufficiently to dry itself out, and the combination of these two circumstances may justify the provision of a spare unit. Similarly, effects of intense heat and cold and whether the motor is located in a well ventilated or confined space have to be considered.

Another factor is that of the facilities available and the methods to be adopted for storing spare motors and their ancillary electrical equipment. The main requirements here are a clean store room having a dry, warm and even temperature. Spare units must also be arranged so as to be easily reached for the purpose of carrying out periodical tests. This routine testing of spares should be considered as an integral

part of the factory maintenance scheme, as a series of tabulated readings of insulation resistances to earth and between phases presents a valuable bill of health for each unit.

Another method of storing spares likely to be needed only occasionally, which is now finding favour, is to seal the unit completely in an air-tight envelope, but to bring the leads out, so that periodical insulation tests can still be carried out.

Spares for controllers and starting equipment need not receive such careful attention. If a number of motors of approximately similar power are in service, the provision of complete spare starting equipment may be justified, but otherwise an ample quantity of spare coils and contact pieces should suffice.

The provision of a large number of spare motors of all types and descriptions should never be used as an excuse for lack of adequate maintenance. Indeed, this is one reason why the supplies of spares should be kept to the minimum consistent with securing reasonable insurance against breakdowns.

Pilot-Cable Faults

Method of Localization on Telephone Type Cables Suspended Beneath Power Lines

By F. K. Fowkes,
A.M.I.E.E.

PILOT cables of the dry-paper-insulated type used for protection and communication and slung as catenaries underneath the associated power lines must be kept in a healthy condition, as inadvertent relay operation will ensue with pilot faults of high values. In view of the general and geographical difficulties attending the repair of such cables the fault must be localized with great accuracy. This accuracy may be achieved by a combination of two methods, namely, normal bridge fault location, followed by an overshooting volt-drop test in the field, using a modified type of Savage valve voltmeter.

The usual fault experienced with such cables is the very-high-resistance type between all cores and earth due to the ingress of moisture through a fracture in the sheath. As a fault resistance of one megohm is sufficient to cause mal-operation of the protective gear, localization must be attempted on such a value. Provided there is sufficient unbalance between the fault resistance of two or more cores, bridge location is possible within not more than 5 per cent of the route length. The valve voltmeter is then used to indicate the position of the fault to within a few feet, obviating the need for breaking down

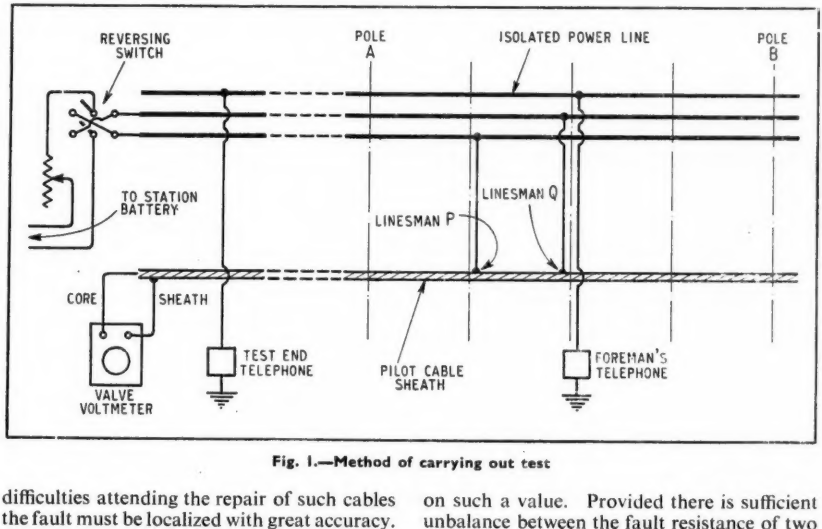


Fig. 1.—Method of carrying out test

and remaking a number of joints "upstairs," with considerable saving in cost and speed of the repair.

The first location given by precision Varley, Werren, bridge or other applicable test will indicate the fault to be, say, between poles A and B a distance of some 400 to 800 yd, according to the condition of the test. The apparatus indicated in Fig. 1 is then set up, linesmen and foreman being dispatched to make the necessary connections to the pilot sheath in the field and establish communication with the testing end.

A first test will cover a span length near the middle of the suspected length and from the known polarity and standard system of connections, which must be adhered to, the test engineer will be able to indicate to the line foreman whether he is past the fault position or not yet up to it. A few halving tests in this manner will soon tie the fault down to one span. The testing electrodes may then be brought closer together where practicable in order to arrive at the actual position of the fault.

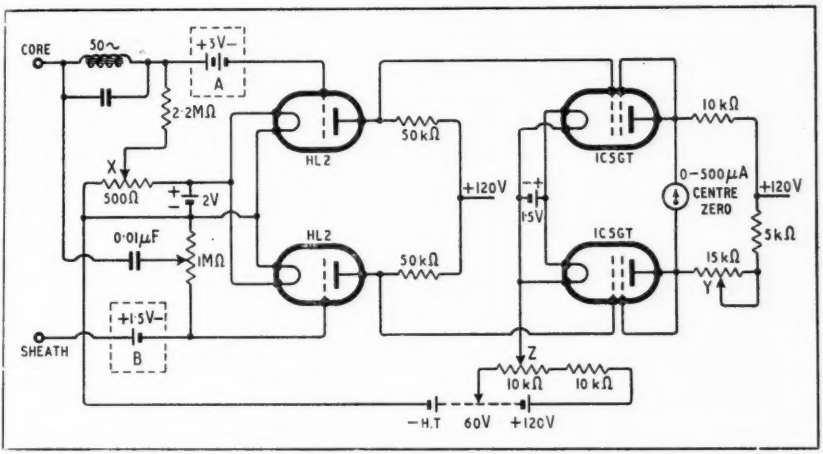


Fig. 2.—Circuit diagram of two-stage valve voltmeter

Valve Voltmeter Arrangement

The use of a two-stage valve voltmeter is preferable, as it enables a robust form of relatively dead-beat indicating instrument to be employed whose direction of swing can be seen without ambiguity. A typical circuit diagram for such an instrument is shown in Fig. 2. The grid circuits of the valves must be effectively screened, especially the grid batteries A and B, which are used in conjunction with the 500-ohm potentiometer to balance electrolytic voltages at the fault.

Fine adjustment of the balance of the two halves of the circuit is controlled by the 15,000-ohm potentiometer Y. Shunts are not needed on the galvanometer as the gain of the last stage can be controlled from zero upwards by the biasing potentiometer Z. Interference from adjacent 50-cycle a.c. power lines and plant is removed from the measuring circuit by the tuned rejector circuit, adjustment being provided for balancing any residual ripple by means of the potentiometer in the grid circuit of the lower HL2 valve. The instrument is sufficiently sensitive to measure the charge on a piece of ebonite excited by friction, while sufficiently stable for use in ordinary conditions.

In practice a current of 20 A gives a completely satisfactory deflection when applied along a length of sheath or surrounding armour no longer than 6 ft. With fault resistances of one megohm, faults can thus be tied down to the exact position under the most onerous conditions. The use of the valve voltmeter for localizing faults has been described by J. H. Savage (*I.E.E. Journal*, Vol. 92, Pt. 2, page 580) to whom the author is indebted for the basic idea of the application here described.

South African Standards

Electrical Safety Code

IN a paper read at the recent annual convention of the Association of Municipal Electricity Undertakings of South Africa and Rhodesia, an account was given of the origin and work of the South African Bureau of Standards by its director, Mr. J. Ritchie. The *South African Electrical Review* reports that Mr. Ritchie mentioned the standardization mark which may be used only by manufacturers for products conforming to the relevant specification and acts as a guarantee that a certain minimum standard is being maintained in the products.

The author said that during the war many South African industrialists established factories for the production of articles formerly obtained from overseas but were unobtainable or in restricted supply. Although in many cases local products equalled or surpassed the imported types there was a prejudice against them and it was felt that the use of a mark would overcome this.

The laboratories and staff of the Bureau played an important part in the framing of specifications and codes by providing technical advice, by trying out projected test methods and by carrying out surveys to ascertain whether the requirements of specifications and codes were reasonable and practicable. They also determined how locally-made materials compared with imported, how difficulties due to shortages of materials were being met, etc. Analyses and check tests were carried out to ensure that articles bearing the Bureau's mark complied with the specifications.

Lamp-Testing Apparatus

Equipment for testing electric lamps was on order and special attention was being devoted by the Bureau's staff to the testing of discharge and fluorescent lamps, with particular reference to the problems involved in the measurement of the light intensity and distribution of coloured sources. A draft specification for motor vehicle batteries had been prepared and equipment for testing batteries for compliance with the specification was being constructed.

Laboratory facilities for checking electricity meters and for the testing of a variety of electrical appliances were being provided. A meter testing code had been prepared, based largely on the British scheme adopted in connection with the Electricity (Meters) Act of 1936. Discussions with the Electricity Control Board with regard to the application of the code were in progress.

The Bureau was also engaged in preparing a safety code for electrical appliances under which specifications would be drawn up for all electrical appliances and supplies sold in South Africa. These specifications would be similar to those of the United States Underwriters' Laboratories and the electrical codes of the Canadian Standards Association. They would set out minimum requirements regarding insulation, air gaps, earthing connections and other safety requirements and compliance with them would be compulsory. All specified equipment would be tested and approved or rejected by the Bureau of Standards.

Aeronautical Exhibition

Variety of Instruments

AT the flying display and exhibition of equipment held by the Society of British Aircraft Constructors (S.B.A.C.) at Radlett, Herts (from September 9th to 12th) nearly 200 firms were represented, including a number of manufacturers displaying electrical and aeronautical equipment. Among them were :—

British Thomson-Houston Co., Ltd., precision speed indicators for aero-engine testing, magnetos, actuators, motors, switches and lighting equipment. Metropolitan-Vickers Electrical Co., Ltd., jet propulsion " Beryl " engine and lighting fittings specially designed for aircraft, including 15- and 20-W fluorescent lamps. Ferranti, Ltd., hyperbolic navigational computor and gyroscopic gun sight. English Electric Co., Ltd., motors, linear and rotary actuators, alternators for de-icing, radio, instruments and flight control. Tufnol, Ltd., insulation moulded to metal for switchgear, small commutators, shock-absorbing dynamo drives and aerial masts. Pritchett & Gold, Ltd., batteries and ground starter trolley. Marconi's Wireless Telegraph Co., Ltd., radio compass, direction finding and communication equipment, voltage regulators and screening harness for aircraft engines. Chloride Electrical Storage Co., Ltd., batteries of the unspillable, ground starter and standard types. Desoutter Bros., Ltd., portable tools. Kelvin, Bottomley & Baird, Ltd., measuring instruments. Delco-Remy-Hyatt, Ltd., small motors and controllers. Henry Hughes & Son, Ltd., compasses, instruments and supersonic flaw detector. Oddie, Bradbury & Cull, Ltd., aircraft wiring and fuse boxes. Plessey Co., Ltd., actuators, wiring systems, plugs and sockets. F. Gilman (B.S.T.), Ltd., flexible shaft tools. Simmonds Aerocessories, Ltd., fuel tank contents gauge. Avimo, Ltd., photographic cathode-ray recorders. Savage & Parsons, Ltd., resistance strain gauges, multi-range bridges and galvanometers.

Other exhibitors included :—W. Canning & Co., Ltd., British Insulated Callender's Cables, Ltd., Decca Navigator Co., Ltd., Electro Hydraulics, Ltd., General Electric Co., Ltd., Joseph Lucas, Ltd., Lodge Plugs, Ltd., K.L.G. Sparking Plugs, Ltd., Newton Bros. (Derby), Ltd., Peto & Radford, Ltd., Rotax, Ltd., Salford Electrical Instruments, Ltd., Sangamo Weston, Ltd., Smith's Aircraft Instruments, Ltd., Sperry Gyroscope Co., Ltd., Standard Telephones & Cables, Ltd., Teddington Controls, Ltd., and Ultra Electric, Ltd.

Fluorescent Street Lighting

Results from London Installations

OPERATIONAL and special test results obtained from the two systems of fluorescent street lighting described in the *Electrical Review* of September 20th and December 18th, 1946, and March 21st, 1947, have been sent us by Central London Electricity, Ltd. Only a brief extract of the report can be given here, but the company has informed us that it will be pleased to supply further details to those interested. One system, in Bond Street (B.T.H. Co.) represented the smallest unit likely to be of value for main roads and the other, in Brompton Road (G.E.C.), gave an upper limit in size of lantern and light output per unit.

Taking first the Bond Street suspended installation of eight lanterns illuminating 200 yd of roadway with 8,660 lumens per 100 ft, the main conclusions may be summarized as follows. Favourable colour characteristics and even illumination of the street surface, together with lack of glare (owing to low intensity of the unobstrusive light source) and excellent visibility, make the installation most acceptable, under both wet and dry road conditions, for shopping centres and other streets having considerable traffic density.

Optimum Spacing

The spacing could be increased from the present 80 ft at a height of 25 ft to 100 ft, but experiments are in hand for determining the optimum arrangement, the aim being to replace existing tungsten lamp installations at the same spacing. Side mounting on columns or central suspension would be satisfactory for a road width of 40 ft with 8 to 10 ft pavement (Bond Street roadway is 28 ft to 30 ft with 7 to 8 ft pavement). With side mounting an overhang of 5 ft to the lantern centre in a road width of 40 ft is required to meet the Ministry of Transport recommendation of 30 ft between lantern centres; this overhang is the maximum likely to be feasible with this type of lantern. The overall cost of fluorescent lighting for a civic centre, while yielding greatly improved illumination, is not expected to exceed that of an equivalent tungsten-lamp equipment. No difficulties have been experienced in cold weather (22 deg F. at switching on) or reduced voltage due to load shedding.

Lighting intensities after the first 100 hours varied with distance from 2 to 0·9 ft-candle with 1·2 and 0·7 ft-candle on the pavement edge. Switching off alternate lamps at midnight gave a patchy appearance, the variation being from 1·9 to 0·15 ft-candle. By leaving only the bottom lamp in each fitting alight, however, more acceptable values of 1·6 and 0·14 ft-candle were obtained. The total power consumption of 2·16 kW (270 W per lantern), equivalent to 350 W per 100 ft of roadway, is 70 per cent of the full pre-war 750-W tungsten lamp installation and produces 8,660 lumens per 100 ft of roadway; after midnight the proportion would be 24 per cent. At 100-ft spacing full power consumption would have been 270 W per 100 ft.

Similar excellent results were obtained from the Brompton Road installation of ten lanterns mounted at a height of 30 ft on concrete columns 120 ft apart, but it was considered that the size of the lanterns and wattage, giving 26,600 lumens per 100 ft or 4½ times the light output for 60 per cent greater consumption than the previous tungsten-lamp installation, was unnecessarily large and that lanterns using four tubes (instead of seven) and spaced up to 150 ft on a 40-ft wide roadway would meet requirements. In that case the overall cost of the far better lighting would be little, if any, above that of a tungsten-lamp installation.

With the present installation, illumination values after 100 hours vary from 3·5 to 0·9 ft-candles, with an average illumination of the footway of over 0·75 ft-candle. The most satisfactory way of economizing electricity after midnight (saving 60 per cent of the full amount) was to leave two tubes alight on each side of the pathway lanterns and one tube on each side of the roadway lanterns, i.e., four lamps and two lamps, respectively, instead of seven per lantern.

Great interest has been shown in the two installations by the local authorities of Kensington and Westminster and neighbouring boroughs and by the Ministry of Transport and Scotland Yard. It is held that capital costs, with the modifications suggested, when the systems have been developed on a commercial production basis, should compare favourably with those of any other system for city centres or busy streets. Maintenance, mainly in the direction of cleaning the exteriors of the lanterns, has presented no untoward problems.

Non-Members at I.E.E. Meetings

BEING satisfied that the arrangement has performed a useful function, the Council of the Institution of Electrical Engineers is to continue the scheme for the admission of non-members to ordinary, section, local centre and informal meetings. The fee for the session will be £1 to cover administrative costs and those taking advantage of the scheme will receive notices of meetings and an invitation card giving entry to the meetings. Visitors will not have the right to participate in discussions without special permission from the chairmen of the meetings.

Municipal Reports

Bradford.—The past year's accounts of the Electricity Department (engineer and manager, Mr. T. H. Carr) record a net profit of £47,475 compared with £40,387 in the preceding year. Income rose by £160,715 to £1,318,762, but this was exceeded by the increase in working expenditure by £172,719 to £1,111,262. Against this is set a decrease of £19,092 in loan and other net revenue charges, which totalled £160,025.

During the year the Department sold 254·5 million kWh, nearly 41 million more than in 1945 46, representing an advance of 19·2 per cent. An additional 3,029 consumers were connected, making the total number at the end of March 80,705. The average revenue per kWh sold was 1·111d. (against 1·175d. in 1945-46); for total income the average was 1·244d. (against 1·301d. in 1945-46).

Eastbourne.—Referring to 163 all-electric prefabricated houses which were connected to the supply during the past year, the borough electrical engineer and manager (Mr. N. Boydell) says that in no case has a tenant expressed anything other than complete satisfaction. Another indication of the trend of public opinion in favour of electrical methods is the fact that 8,787 items valued at £22,788 were sold at the showrooms, compared with 4,510 articles with a value of £8,612 in the previous year, the figures for which had themselves constituted a record.

The undertaking last year sold 47·2 million kWh (including 26·7 million under the domestic two-part tariff) compared with 35·5 million kWh in 1945-46, and has thus more than recovered from its war experiences. The reopening and reconstruction of hotels resulted in a considerable increase in the demand for heavy-duty cooking equipment. At March 31st consumers numbered 22,007, a net increase of 1,537.

Income rose by £90,461 to £376,996 and working expenses, at £325,672, were up by £86,984. Loan charges, etc., further declined from £41,467 to £37,889, and there was a net profit on the year of £13,435 (against £6,379). Average revenue from the sale of electricity fell from 1·62d. to 1·55d.

West Ham.—There are still some 12,000 fewer consumers than before the war (the number at March 31st last was 44,382) but the loss of sales has now been more than recovered. The annual report of the engineer and manager, Mr. J. W. J. Townley shows that the quantity of electricity sold last year, 172·8 million kWh, compares with 150·9 million in the previous year and 161·8 million in 1938-39 (excluding bulk supply).

The Department generated 148·1 million kWh, an increase of 27·5 million, although the maximum demand was lower (58,100 kW against 63,400 kW). The engineer comments that the performance of the station was excellent, particularly having regard to the fact that apart from one 30,000-kW set and associated boilers all the plant is over twenty years old and some more than twenty-five. Erection of plant for the first section of the new station is due to begin this autumn and tenders have been accepted for some plant for the second section.

Gross revenue of the undertaking amounted to £1,069,246 (against £929,796), with working expenses at £862,997 (£740,511), and there was a net profit after meeting all charges of £72,951 (£53,535). The average price received per kWh sold was unchanged at 1·28d.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Portable Tool Protection

WITH regard to Mr. Grove's letter in the *Electrical Review* of August 15th, relating to the tragic accident at Meaford, I heartily endorse his sentiments. It is all the more regrettable because there are instruments on the market which would have made such an accident impossible. I refer in particular to the "full load earth tester," which passes a full load current through the earth conductor of the instrument under test causing it to burn out if only one or two strands are remaining, in which case a visual indication is given. If the earth conductor is already open circuited an immediate indication is given.

Many large industrial concerns employing numerous portable tools already use this instrument.

Hatch End, Middlesex. S. M. LLOYD.

[The name of one of the contributors of letters on "Armature Drop Testing" mentioned in our issue of August 29th is Mr. C. F. Harding-Potter—not C. F. Harding, as printed.—Editors, *Electrical Review*.]

Next Week's Events

Monday, September 15th

BIRMINGHAM. — Grand Hotel. 6.30 p.m. Birmingham Electric Club. Presidential address by Mr. N. M. Hill.

Monday to Friday, September 15th-19th

SOUTHPORT.—Association of Public Lighting Engineers. Annual conference.

Tuesday and Wednesday, September 16th-17th

LEEDS. — University. Institute of Physics. Conference on electron microscopy.

Wednesday, September 17th

MANCHESTER.—2.30 p.m. Manchester Association of Engineers. Visit to the works of Mather & Platt, Ltd., Newton Heath.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Ministry of Fuel and Power has appointed **Sir John Kennedy** chairman of the Electricity Commsioners in succession to Sir Cyril Hurcomb who, as already reported, has become chairman of the new British Transport Commission. Sir John Kennedy was for thirty-two years partner in the consulting firm of Kennedy & Donkin, who prepared a scheme in 1922 for the Electricity Commissioners on the reorganization of electricity supply in Great Britain. He was appointed an Electricity Commissioner in 1934 and has been deputy-chairman for nine years. Last January he was elected an honorary member of the Institution of Electrical Engineers of which he was president in 1935.

Sir John Kennedy

After serving for fifteen years as chairman of the Executive Committee of the Council of the Electrical Contractors' Association, **Mr. W. H. Walton** (Pinching & Walton, Ltd.), a past-president, has decided to retire from that position. He is succeeded by **Mr. W. T. Hellaby** (W. T. Hellaby & Co., Ltd., Birmingham). Mr. Hellaby started his career in the electricity supply industry as a pupil with Mr. A. H. Seabrook in the Barking Electricity Supply Department and later served with the West Ham and Sunderland undertakings. After a period in the Royal Flying Corps in the 1914–18 war he became engineer to Handley & Robinson, Ltd., electrical contractors, Birmingham, and was subsequently managing director to their successors. He formed his present company in 1923. Mr. Hellaby acted as chairman of the Birmingham branch of the E.C.A. from 1936 to 1940 and was chairman of the Midland Board in 1939 and in 1941-43. He joined the E.C.A. Council in 1940 and the Executive Council in 1941.

Mr. W. H. Walton

Mr. W. T. Hellaby

As announced last week **Mr. H. C. Hastings**, chief of the Control Gear Engineering Department of the British Thomson-Houston Co., Ltd. retired at the end of August, after forty-nine years' service with the company. After early technical training at the Finsbury Technical College, he joined the B.T.H. Company and was in charge of the meter section of the Test Department, London, when the Rugby Works was built. He was one of the original staff at Rugby, being initially in the Switchboard Engineering Department and subsequently in the Control Gear Engineering Department on its formation in 1903. He was placed in charge in 1908, since when he has been responsible for the development of electric traction and industrial control gear. He was one of the pioneers in the design of contactors and their application to electric traction and industry. He designed the earliest contactor equipments for the multiple-unit control of electric trains, and among his achievements in the industrial field was the design of contactor equipments for some of the earliest rolling mill equipments and for auxiliary drives for steel mills, such as live rolls and screw-downs. Under his guidance the successful design of automatic substations, control for electric ship propulsion, and for such industrial applications as paper-making, machine tools, textile machinery, sootblowers, boilerhouse auxiliaries, etc., has been accomplished.

Mr. H. C. Hastings

Mr. C. J. Sarjeant

Mr. C. J. Sarjeant, who has been appointed to succeed Mr. Hastings, obtained his theoretical engineering training at the Battersea Polytechnic, London. He joined the B.T.H. Co. in 1911 as an assistant in the Test Department. Practical training was interrupted when in August, 1914, he joined the R.F.A. He took part in the Suvla Bay landing, and later saw service in France. Rejoining the company's Test Department, Mr. Sarjeant went to the Control Gear Engineering

Department in June, 1919. During the past twenty-eight years he has been closely identified with the development of contactor control gear in general and fully automatic substation control in particular. In this connection he went to South Africa in 1928 to supervise the final installation of the 3,000-V d.c. automatic substations of the South African railway electrification scheme.

Mr. H. N. Henry, head of the department of mechanical and electrical engineering at Coatbridge (Lanarkshire) Technical College, has been appointed principal of the Paisley Technical College and School of Art in succession to **Mr. J. Denholm,** who has retired. Mr. Henry received his technical education at the Royal Technical College, Glasgow, where he was later research assistant under Professor A. I. Mellanby. Subsequently he was head of the engineering and trades department of Swindon Technical College.

The Belfast Corporation Electricity Committee has recommended that the city engineer, Mr. W. J. McC. Girvan should be authorized to seek the approval of the Ministry of Labour to the engagement, in a temporary capacity, of **Mr. W. Szwander,** a Pole, who is shortly to be naturalized, as chief technical assistant in the Electricity Department. Mr. Szwander served in the Polish Army and came to Britain in 1940. Since 1941 he has been engaged by the Metropolitan-Vickers Electrical Co., Ltd., on power station plant. Mr. Girvan said that there was no other suitable candidate.

Mr. P. M. Edinborough has joined the staff of Frank Westerman (Wholesale), Ltd., as general manager. After twelve years with the Metro-Vick-A.E.I. Group in administrative capacities, Mr. Edinborough became general manager of Elexcel, Ltd., leaving after six years to take up the position of commercial and sales manager with the Britmac Electrical Co., Ltd. From 1940 to 1947 he served in the Man-Power Office of the Ministry of Labour and National Service, latterly operating on the Government's "Training Within Industry" scheme.

Mr. P. M. Edinborough

Col. C. H. de Nordwall, M.I.E.E. has resigned from the appointment of Director of the Electrical and Instrument Equipment Branch in the Industry Division of the Control Commission for Germany and has rejoined the Metropolitan-Vickers Electrical Co., Ltd.

Mr. A. W. Fisher has been appointed Yorkshire area manager for Trustful Products, Ltd., as from September 22nd. He will be at the company's office in Crown Street, Leeds.

Mr. C. G. Le Feuvre, M.I.E.E., district superintendent in the Southgate area of the Northmet Power Co. is retiring from that position and is going to Jersey where he intends to take up farming. Mr. Le Feuvre is succeeded at Southgate by **Mr. W. R. B. Wood** of Chingford.

Mr. C. L. Kent has been appointed London office manager for the Wardle Engineering Co., Ltd., in succession to the late Mr. Gunner.

Mr. Wilmot, Minister of Supply, during his tour of selected Scottish industrial establishments, visited Scottish Cables, Ltd., Renfrew,

Mr. Wilmot, Minister of Supply (left) with Mr. W. Fraser, chairman and managing director, Scottish Cables, Ltd., during the Minister's visit to the company's Renfrew works

on September 3rd. On his arrival Mr. Wilmot was greeted by **Mr. William Fraser,** M.I.E.E., chairman and managing director, and conducted on a tour of the factory where he saw cable from the smallest domestic flexible wires to 33-kV types being manufactured. He was interested in the company's electrical test departments and particularly in the research laboratories. Afterwards Mr. Wilmot and his party were entertained by Mr. Fraser and his co-directors to lunch in the new canteen.

Mr. L. G. Aston, A.M.I.E.E., on leaving Brierfield to take up the position of electrical engineer at Dorchester, received a gold propelling pencil from employees of the Electricity Department. Mr. J. Robinson, technical assistant, made the presentation. Mr. Aston's successor as electrical engineer at Brierfield is **Mr. G. E. W. Hird.**

Obituary

Mr. A. D. Mackinnon.—We regret to announce the death at his home on August 28th, 1947, of Mr. Angus Dow Mackinnon, of the B.T.H. Industrial Motor Sales Department. Mr. Mackinnon was born in Glasgow in 1887. He was apprenticed to the Caledonian Railway Co., studied at the Glasgow Technical College,

and served a further apprenticeship with Mavor & Coulson.

He joined the Test Department of the B.T.H. in 1909, and after a period in the A.C. Engineering Department, went to the Supply Department in 1913. He served in the Glasgow District Office from 1921, until his appointment as manager of the Middlesbrough District Office in 1930. In 1933 he also took over the managership of the Newcastle-on-Tyne District Office. Later, because of ill-health, he returned to Rugby in 1936, and at the time of his death was engaged in work in connection with synchronous electrical machinery.

Mr. J. Chapman.—The *South African Mining and Engineering Journal* of August 9th records the death at Rustenburg, Western Transvaal, of Mr. James Chapman, who for nearly fifty years was associated with Fraser & Chalmers. He was chief designer at the Erith works when, in 1909, he went to South Africa for the company. In 1918 he became general manager of the newly formed Fraser & Chalmers (S.A.), Ltd., and later held the position of managing director until his retirement in 1944.

Wills. — Captain A. J. Mayne, O.B.E., M.I.E.E., Runfold, Farnham, Surrey, left £9,778 gross (net personalty £9,664).

Mr. E. W. P. Fulcher, M.B.E., A.M.I.E.E., Wimbledon, left £20,013 gross (net personalty £19,942).

Dr. A. H. Jay, of the Research and Development Department of the United Steel Companies, left £4,130, "so far as can at present be ascertained" (net personalty £3,630).

S.A. Engineers' Salaries

AT its annual meeting in Durban this year the Association of Municipal Undertakings of South Africa and Rhodesia adopted, in principle, a recommended scale of salaries for electrical engineers. According to a report in the *South African Electrical Review*, the scale applies to the chief electrical engineers of any public authority authorized to supply electricity and is based on a "unit assessment" defined as the total number of units sold per annum less 25 per cent of any units purchased by the supply authority.

The scale is in eight steps: for a unit assessment of under 500,000 kWh the minimum salary (exclusive of all allowances) is £600; over this and under 2 million kWh the minimum is £700; from 2 to 3 million, £800; from 3 to 5 million, £900; from 5 to 10 million, £1,000; from 10 to 25 million, £1,250; from 25 to 50 million, £1,500; and 50 to 100 million, £1,750.

Where the adoption of the scale involves a salary increase of more than £100 upon the existing salary an undertaking may pay it by annual increments of not less than £100. Upon the appointment of a new chief electrical engineer an undertaking has the option of paying 85 per cent of the scheduled salary for one year, 92 per cent for the next year and the full salary thereafter. Where the existing salary is higher than the scale figure it shall be continued for the present holder of the position and when the chief electrical engineer is in full charge of other municipal departments the schedule salary shall be increased by an appropriate amount.

Patent Committee's Report

AMONG the recommendations of the Departmental Committee on Patent Law in its third and final report (Cmd. 7206, H.M. Stationery Office, 1s. 6d.) are a number on the position of sole licensees. It is proposed that exclusive licensees should be able to institute proceedings for infringement of patents and to apply for extensions of the terms of patents. If an exclusive licensee, or other person, is adversely affected by the Crown user of a patent, he should be allowed a proportionate share of any compensation which may be paid, instead of the whole going to the inventor.

If a manufacturer wishes to undertake the production of articles which he thinks may expose him to action for infringement and is unable to ascertain from the patentee whether this would be the case, he should be able to bring an action against the patentee for a declaration that the proposed manufacture would not be an infringement.

The Committee recommends that the Comptroller of Patents should be empowered to give decisions in disputes between employers and employees as to the ownership of inventions made by the employees.

A number of recommendations are also made in connection with the registration of designs. The abolition of the present registration by classes is proposed and the Committee suggests various other improvements in the present system.

Better premises are proposed for the Patent Office as soon as circumstances allow this. In general no alterations in present fees are recommended although in certain cases a reduction might be made.

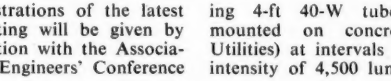
Midland Engineers' Ball Postponed

IN view of the rationing situation and other considerations, it has been decided that the Annual Ball of the Midland Electrical Engineers' Association, arranged for November 21st will have to be postponed until a later date. As the profits of this Ball benefit the Benevolent Fund of the Institution of Electrical Engineers, it is hoped that would-be contributors will see that the fund does not suffer and will send their subscriptions to Mr. W. E. Clark, c/o English Electric Co., Central House, New Street, Birmingham. Further announcements regarding the Ball will be sent in due course.

Public Lighting Progress

Equipment to be Demonstrated at the A.P.L.E. Conference

TEN separate demonstrations of the latest types of street lighting will be given by manufacturers in connection with the Association of Public Lighting Engineers' Conference which is to be held at Southport from Monday to Friday next week. In Kingsway and Coronation Walk will be seen the Revo " Sol-etern " lanterns claimed to be the first units specially produced for use with only two 80-Watt 5-ft fluorescent lamps (Philips). The fitting is mounted at 25 ft either on a bracket arm or twin span wires. There is easy access to the control gear while a " Perspex " cover hinged on one side for reaching the lamps and reflectors, makes the unit dust-tight. The anodized aluminium reflectors have a highly specular finish. Examples of the company's steel and concrete standards equipped with " Sol-etern " and other lanterns are on show in Princes Park.



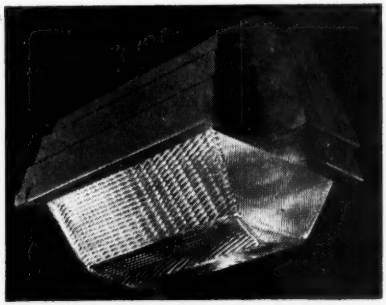
Revo " Sol-etern " lantern for two 80-W fluorescent lamps

A year ago, delegates to the A.P.L.E. Conference saw one of the first experimental fluorescent street lighting installations planned by the British Thomson-Houston Co., Ltd., in Old Bond Street, London. A demonstration in Nevill Street shows an improved model now in full production accommodating three " Mazda " 80-W 5-ft fluorescent lamps. Part of the street being comparatively narrow, four lanterns have been sited at single, staggered 120-ft spacing. In the wider part of the street four lanterns, at the same spacing, are mounted in pairs opposite each other. The lanterns are mounted, at 25 ft, on specially designed columns made by Concrete Utilities, Ltd. This combination of spacing and mounting height gives 5,000 lumens per 100 ft of road in the narrow part, and 10,000 lumens per 100 ft in the wider. Each lamp has its own reflector, and the circuit is so arranged that the two side lamps can be switched off.

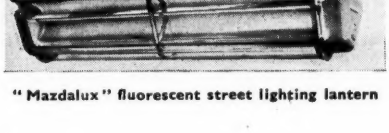
Lighting by fluorescent tubes is also a feature of Hoghton Street where the General Electric Co., Ltd., has seven 4-lamp lanterns incorporating 4-ft 40-W tubes. These lanterns are mounted on concrete columns (Concrete Utilities) at intervals of 110-120 ft to give an intensity of 4,500 lumens per 100 ft of road. All the auxiliary gear is housed in the roof of the unit. Twenty of these lanterns are about to be installed at Coventry.

In another section of the same street Falk, Stadelmann & Co., Ltd., have installed eight bowl-refractor "Hilux" lanterns with 400-W mercury discharge lamps. They comprise a heavy-gauge sheet copper casing and vitreous-enamelled sheet steel inner and outer reflectors. A cast-iron crown is provided with condensation-proof connector box. The single-piece bowl refractor is available for 160 deg non-axial or 180 deg axial distribution.

In London Road, Holophane, Ltd., have used their " Dilux " lantern as a typical example of the latest street-lighting practice. Each is fitted with a 400-W magnetically-controlled horizontally-burning mercury-discharge lamp, giving, at 25 ft with 120 ft between standards, a light output of 7,350 lumens per 100 ft of road. Approximately 90 per cent of the light is directed into the lower hemisphere so that stray upper emission is virtually eliminated, and by careful choice of beam angle and the provision of a controlled cut off, dazzle and glare are avoided.



Holophane " Dilux " lantern

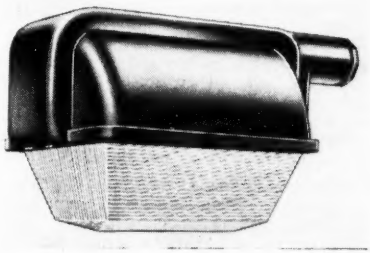


" Mazdalux " fluorescent street lighting lantern

To save labour during the present crisis Siemens Electric Lamps & Supplies, Ltd., decided to make use of eight existing poles for its demonstrations in East Bank Street even though they were not ideally sited. Brackets

have been designed and attached to the columns. The newly-designed " Euston-Sieray " lantern houses 250-W " Sieray " MA/V lamps burning horizontally with magnetic arc deflectors and employs a Holophane dish refractor. It is constructed of aluminium alloy, and designed primarily for side entry although it can be made suitable for pendant mounting. The light output per 100 ft of road is about 4,500 lumens.

Lighting efficiency, robust construction and low maintenance are merits emphasized by the Engineering & Lighting Equipment Co., Ltd., in connection with another installation in East Bank Street of 140-W " Philora " sodium discharge lamps in " Golden Ray " fittings. Special attention is drawn to the evenness of distribution, absence of disability glare and the resulting visibility. The fittings are spaced on one side of the street, 35 ft apart on an average and are mounted at a height of 25 ft.

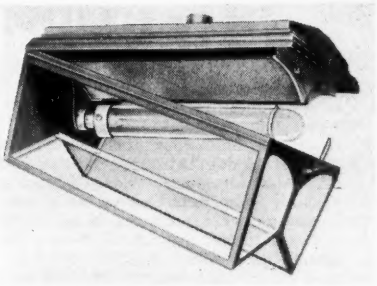


Siemens " Euston-Sieray "

Three manufacturers are participating in displays in Scarisbrick New Road. The Wardle Engineering Co., Ltd., has installed its " Solar " cut-off type traction arm fitting comprising a cast-iron top and cast-iron end plates with top mirrors and bottom mirrors supported by die-cast clips. The spacing is 120 ft, the mounting height 21 ft 6 in. and the overhang 12 ft. With a 140-W " Philora " sodium lamp the output is approximately 8,050 lumens, 96 per cent of the output being below the horizontal.

Wardle " Solar " cut-off type traction arm fitting

The Brighton Lighting & Electrical Engineering Co., Ltd., is introducing a new totally-enclosed reflector lantern employing horizontal 140-W " Philora " sodium lamps. Both upward and downward light are controlled to augment the natural sideway emission of light, 80-90 per cent of the total light thus being given at the wide lateral angles required. In the upper portion ,of the cast hood are two specially-shaped mirror reflectors re-directing the upward light from the lamp outwards and downwards to give a maximum beam between 65 and 85 deg from the downward vertical. The lantern body is made of a " W " section with the base glazing re-directing a proportion of the light rays. Advantages claimed are maximum light output, very wide directional beams, large illuminated surface area, low glare factor, high visibility, total enclosure, easy accessibility and simple maintenance.



Brighton Lighting Co., " Bleco W " street lighting lantern

The third company demonstrating in Scarisbrick New Road is the Metropolitan-Vickers Electrical Co., Ltd., whose " Trafford " lantern especially designed for Group " A " roads is now available for top or side entry. This lantern takes 250-W or 400-W mercury discharge lamps burning horizontally, and possesses the advantage of close control of light in the vertical plane to ensure the best distribution for maximum road brightness, with the avoidance of glare, while at the same time a broad controlled distribution in plan is simply effected. When the lantern is opened the bowl remains securely fixed to the supporting ring, but by means of a detachable hook hinge the whole may be easily lifted from the canopy for cleaning or replacement. A magnetic device for controlling the arc is incorporated as standard.

Apart from these lighting demonstrations various types of standards are also to be displayed. Seven different models of " Adastra " galvanized sectional steel units made by Poles, Ltd., will be seen at various sites, and tubular steel poles made by Stewarts & Lloyds, Ltd., have been erected on the sea front. A full range of Concrete Utilities reinforced concrete columns in various finishes can be inspected in Princes Park and special attention is drawn to the bracket fixing which incorporates a tension bolt and safety tube to ensure rigid and secure fixing. Illuminated guard posts have been erected by Gowshall, Ltd.

NEW BOOKS

Alternating Current Textbook. British Research Organizations.

A Course in Electrical Engineering, Vol. II—Alternating Currents. By Chester L. Dawes, Dr. Eng. (Fourth Edition). Pp. 708; figs. 504; index. McGraw-Hill Publishing Co., Aldwych House, Aldwych, London, W.C.2. Price 25s.

Alternating current theory and its applications are so vast a subject that no two books under the general title "Alternating Currents" cover the same field. Each has to be judged on its own merits within the scope chosen by the author.

The volume under review (of American origin) is a textbook of special merit, now in its fourth edition. It is very well balanced and covers a wide field in sufficient detail to make it of real value to the student. The explanations are most lucid and they make the book a pleasure to read.

It is now about twelve years since this volume was last revised and during the interval many and diverse developments have taken place. Quite frequently an author, in preparing a new edition, has to condense the fundamental material in order to compass a wider field of applications. In this case, however, the fundamental theory has actually been considerably expanded to meet the requirements of new applications which have been included to bring the work thoroughly up to date.

Only in the case of a book of merit is the reviewer presented with opportunity for criticism of a constructive nature. Chapter III on "Complex Quantities" is devoted mainly to rectangular co-ordinate notation and is perhaps a little short. It is felt that the significance of the imaginary number $\sqrt{-1}$ is somewhat overstressed and that the student is liable to be a little puzzled by it. For, after all, two vectors at right angles denoted by V_1 and jV_2 represent equally real physical quantities. To refer to one as real and the other as imaginary is hardly helpful to the student. To say that "j" is an imaginary number is the same thing as saying it is not a number! It is in fact an operator which, when applied to a vector, advances that vector counterclockwise by one right angle. Similarly j^2 is an operator implying rotation through two right angles, resulting in a reversal of the vector and for this reason j^2 is equivalent to -1. But this does not completely justify writing $j = \sqrt{-1}$, for j^2 does not mean "j squared" in the ordinary algebraic sense. It means "j applied twice in succession" to the same vector. It would seem questionable therefore whether the concept $\sqrt{-1}$ would not be best avoided altogether.

It is gratifying to note the use of the double subscript notation in 3-phase circuit theory, making it so much easier for the student. A note of minor criticism might be levelled at the confusion of radians and degrees on page 129 where, in equations 115b and 115c, the expressions $(\omega t - 120°)$ and $(\omega t - 240°)$ appear. Since $\omega = 2\pi \times$ frequency, in radians per second, ωt is in radians and the above expressions are not admissible.

The chapters on a.c. machinery are in most respects exceedingly good, the treatment of the alternator and the synchronous motor being lucid and convincing.

Chapter XIV on electron tubes has been written by independent specialists, R. F. Field and R. G. Bousquet, both of the General Radio Company, Cambridge, Mass., and is in keeping with the high standard of the remainder of the book.

A most valuable and remarkable feature is the number of questions and problems at the end of the book. There are no fewer than 458 numerical problems and a similar number of descriptive questions, classified according to relevant chapters, and the author points out that all the problems are new ones.—S.O.P.

Industrial Research, 1947. Advisory Editor, Percy Dunsheath. Pp. 535. Todd Reference Books, Ltd., 49 Park Lane, W.1. Price, 25s.

In June of last year we reviewed the first edition of this work, which was the first to bring under one cover scattered information relating to the various research organizations in Great Britain. In the present volume opportunities have been taken to revise, re-arrange, supplement and bring up-to-date the subject matter and to add several new sections, which include a directory of research consultants, the report of the Federation of British Industries on research in technical colleges and the recommendations of the working parties of the Board of Trade in regard to research in industry. The number of pages in the volume has, however, been reduced by the omission of articles by individual authors which appeared in its predecessor.—C.O.B.

Books Received

Introducing Radio Receiver Servicing. By F. M. Squire. 2nd edition. Pp. 144; figs. 151; index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, London, W.C.2. Price 7s. 6d.

Textbook of Illuminating Engineering. By J. W. T. Walsh, M.A., D.Sc. Pp. 191; figs. 135; index. Sir Isaac Pitman & Sons, Ltd. Price 17s. 6d.

Power Station Efficiency. By C. W. Priest, B.Sc., M.I.E.E., A.M.I.Mech.E. Pp. 119; figs. 26; index. Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d.

COMMERCE and INDUSTRY

European Fuel and Power. 1947-48 Lighting Season.

THE committee on fuel and power of the European Economic Conference has pointed out that before the war the production and consumption of coal in the sixteen countries represented and Germany were about equal. Total output in 1938 was 550 million tons; it fell to 309 million tons by 1945. This year's production is expected to be 440 million tons and it is hoped that by 1951 the total will reach 584 million tons of which Great Britain is expected to contribute 251 million tons.

Total installed electric power is put at 43 million kW and programmes have been drawn up to raise this to 65 million kW by 1951. The joint development and use of the water power of the Alpine *massif* is contemplated.

E.I.B.A. Berks and Bucks Branch

The Berks and Bucks Branch of the Electrical Industries Benevolent Association is to be reformed on an active footing and a general meeting is being held at the Ship Hotel, Reading, on September 24th, at 3 p.m.

Lamp Publicity

In connection with the 1947/48 lamp publicity scheme planned by Siemens Electric Lamps & Supplies, Ltd., a series of display advertisements will appear in the national and provincial press. In addition there will be a display advertisement in the principal trade journals, stressing the economy of good lighting in making possible increased production, and at the same time offering the skilled advice of the Siemens lighting engineers on all matters appertaining to planned factory lighting.

Siemens lamp display cut-out

A new " Big Ben " showcard printed in eight colours with the slogan " Siemens Lamps as Reliable as Big Ben " is accompanied by a new lamp display cut-out in ten colours with the caption " Light is Life." Measuring 24 in. by 19 in. the latter forms a most attractive centrepiece. A dealers' window dressing service is available. Lamp price lists are available for the trade on request.

In the forthcoming lamp season Crompton Parkinson, Ltd., will continue their present " prestige " theme drawing attention to the outstanding work accomplished by Colonel R. E. Crompton. London and provincial newspapers and weekly periodicals will be used on a similar wide scale as hitherto. Display material available consists of a new Crompton 12 in. by 10 in. cut-out, in two planes and in eight colours, carrying a fuel economy message. For Kye lamps a 29 in. by 19 in. cut-out features a price economy appeal in the caption " A Shining Light for a Shilling." Attractive price lists for distribution to the public "tie up" with the press campaign. Stockists will receive much more comprehensive price lists. Window dressings for both Crompton and Kye lamps will be available to those dealers especially requiring them.

New cut-out designs available in connection with the Crompton and Kye advertising campaigns

New " Betro " Service

The British Export Trade Research Organization has started a new drive to help manufacturers find markets in those countries which are now putting up high tariffs against British goods or banning them completely, in order to foster their own national industries. In a special announcement just made to its members, " Betro " points out that many manufacturers do not realize fully the value of their patents, trade marks and registered designs as potential invisible exports. Even where there are no patents or trade marks, considerable sums of money can be made by entering into what is generally known as a " Know-how " contract with foreign manufacturers. A special department has been set up in " Betro " which is already busy negotiating for the sale on a royalty basis of the " Know-how " of a well-

established British product which has hitherto (for various reasons) been unable to get inside the tariff walls. In this way dollars can be earned without making any drain on the country's material resources. Interested companies should put their problems to the Secretary, " Betro," 48, Dover Street, London, W.1.

E.D.A. Conference at Southport

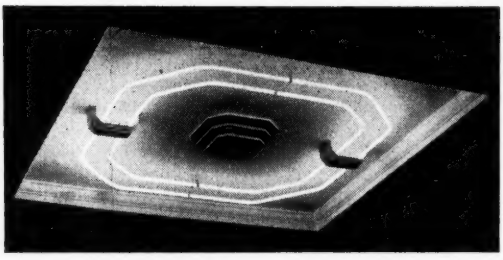
The North-West England and North Wales Area of the British Electrical Development Association is to hold a three-day conference at Southport from September 22nd to 24th. Papers will be given on " The Organization of a Consumer Service " by Mr. O. Howarth (Lanf cashire Electric Power Co.); " The Future o-Electricity Supply—the Consumers' Viewpoint," by three consumers; " Electricity in Sparsely Populated Rural Areas," by Mr. S. G. Roper (North Wales Power Co.); " Practical Aspects of Street Lighting," by Mr. C. C. Smith (deputy city lighting engineer, Liverpool); and " Recent Developments in Street Lighting," by Mr. W. Robinson (Lighting Service Bureau). The conference luncheon will be held on September 23rd.

Trolley-bus Maintenance

Senior members of the technical staffs of trolley-bus undertakings are to attend a trolley-bus maintenance school at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., towards the end of this month.

Fluorescent Store Lighting

An installation of cold-cathode fluorescent lighting has just been carried out by the General Electric Co., Ltd., at the Pantheon store of Marks & Spencer, Ltd., Oxford Street, London, W.1. Sixteen 6 ft square panels each comprise 30 ft of 120 MA intermediate white tube arranged in two 15-ft lengths, one to a transformer, this being the most efficient way of utilizing the output of one transformer. Each tube takes the form of a double " U," two identical tubes set face to face forming one complete unit. Two small boxes contain the turn-round of one tube and the electrodes of the other, the latter being turned up at 90 deg to their respective tubes and projected upwards inside the false ceiling into suitable electrode boxes. A stepped motif in the centre conceals the access entry to the gear in the void between the hung ceiling and the concrete slab approximately 24 in. above. The electrical contractors were H. Cripps & Co.



One of the fluorescent lighting fittings installed at Marks & Spencer's Pantheon store, London

Accrington Power Station Fees

The question of how a refund of fees by the consultants for Accrington's £6,000,000 generating station scheme is to be allocated among Corporation officials is in abeyance. The consultants agreed to return about £12,000 over six years, for distribution among officials working on the scheme. They have now paid the first instalment. The Electricity Committee proposes to take legal opinion on whether the payments must be taken into account for superannuation purposes.

Women Welders

Agreement has been reached between shipbuilding firms and the unions for the employment of women welders in Teesside shipyards. The women will work mainly on preliminary track welding and the more difficult work will be done by men. The need for women welders has been brought about by the increased use of welding as opposed to riveting.

Australia Restricts " Dollar " Imports

To redress the adverse balance of trade with the United States, amounting to between $75 and $100 million, the Australian Government has decided to stop or reduce the importation of a number of classes of American goods. Included among the articles which are entirely banned are washing machines, electric ironers, electric stoves and fluorescent lamps. Radio valves are one class in which reductions are to be made.

Accumulator Makers' Jubilee

This month marks the golden jubilee of the Tudor Accumulator Co., Ltd., which takes its name from the late Mr. Henry Tudor. In the early days when it was usual to run generating plants only during daytime, batteries carried the load at night. The company instituted a system of agreements whereby electric lighting plants were installed in public institutions and private houses and were regularly maintained by the company — at one time some 500 plants, scattered throughout the country, were run on these lines. Also, in the days when electrical machinery was not very flexible as regards violent alterations in load, the battery served a useful purpose on traction systems. One of the

largest batteries ever supplied, weighing 1,500 tons and capable of discharging at up to 10,000 A at 600 V, was installed by the company in Rio de Janeiro as a stand-by for the city's tramway system. In 1912 a fleet of buses was run entirely by batteries between Liverpool Street and Victoria. So soon as the demand for batteries in one direction lessens, others emerge. Nowadays they are needed in large numbers for switchgear operation, Post Office telephones, broadcasting and emergency lighting. During the war years all those interests were subjugated to the main task of turning out submarine and torpedo-firing batteries.

Huddersfield Fuel Efficiency Campaign

In connection with a campaign launched by the Huddersfield Fuel Efficiency Committee, a striking window display has been arranged at the Electricity Showrooms. Two large panels, each bearing three coloured diagrams or drawings of a cooker hotplate, electric kettle, refrigerator, electric fire, cooker and saucepan, are suitably "taped" to actual appliances. Two electric cookers show the most economical method of use, while a water heating display demonstrates the correct way of lagging the pipeline and jacketing the cylinder. Occupying the front centre of the window is a large model meter, which besides instructing the public in the art of meter reading also draws attention to the fact that even a 15-W lamp causes the disc of the meter to revolve. A notice explains that the 15-W lamp uses only 1 kWh in three weeks and the public is asked to pardon this small waste of energy, which would be justified if a saving of 25 per cent (or 14,000,000 kWh) in Huddersfield's domestic consumption is achieved as a result of the campaign. All other exhibits in the window are suitably "tied up" with slogans and economy hints, and across the whole length of the window, a 20-ft banner bears the slogan :—"Save Coal by Using Electricity Sparingly."

Tool Makers' Craft Certificate

Following widespread adoption of the model indenture prepared by the Education and Apprenticeship Committee of the Gauge and Tool Makers' Association, the Council has decided to award a special certificate to craftsmen in the precision gauge and tool industry, bearing the Association's seal and the signatures of the various officers.

Applicants for the certificate should be tool makers who have served a bona fide apprenticeship with a member of the Association and have passed the final examination of the City & Guilds of London Institute Machinists', Turners', and Fitters' Course. Further particulars can be obtained from the Secretary of the Association, Standbrook House, Old Bond Street, London, W.1.

Floor-heating System

A new method of low-temperature floor radiation space heating has recently been installed in several hospitals, clinics, factories, private houses, farms, garages and public buildings by Mr. J. S. A. Primrose, M.I.E.E., 172, Pitt Street, Glasgow, the patentee of the system. Insulated cable is laid at a depth below a finished floor surface of tile, terrazzo, cement or prefabricated concrete slabbing, the heat being spread evenly over the entire surface by means of a system of heat conducting netting. This netting, below the final floor surface, ensures a temperature within $\pm$ 0·5 deg F throughout the whole heated surface.

Electric floor-heating system being installed in a factory

The method is applicable principally to new construction since for the best results, it should form a basic part of the fabrication of the building. It has, however, been successfully added as a superimposed layer to an existing floor. Thermostatic and time clock control permit the restriction of load to off-peak-load hours, thermal storage being achieved in the actual fabric of the building. Thermograph records show that, in one building where the system is now in use, temperature was maintained at 60 deg F at 4 ft from the floor over a

24-hr period, with a variation of less than ± 1 deg F. There was a drop of only 6 deg F 18 hours after power had been switched off. The average outside temperature during the test period was 43·5 deg F.

B.I.F. Space Applications

A reminder has been issued that September 20th is the latest date for the receipt of applications for space in the 1948 British Industries Fair (May 3rd to 14th). Applications received after that date will be regarded as "late entries" and no guarantee can be given that space will be made available. Application forms are obtainable from the Export Promotion Department, Board of Trade, 35, Old Queen Street, S.W.1 (London Sections) or the Birmingham Chamber of Commerce, 95, New Street, Birmingham, 2 (Birmingham Sections).

Food Production at Sheffield

The Parks Committee of the Sheffield Corporation holds an annual Food Production Show in Endcliffe Park in which the Electricity Department of the Corporation has, in the past few years, played an increasing part. In the show held at the end of August, the Electricity Department was allocated a whole marquee, and exhibited electric hatching and rearing equipment for the poultry farmer, soil and greenhouse heating equipment for the gardener, nurseryman and horticulturalist, sterilizing equipment for the dairy farmer and ice cream manufacturer, and pumps, hedge clippers, wood cutting machinery, etc., for the farmer. A display of domestic equipment was also included.

Trade Publications

Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11.—Illustrated folder (interim, Z.S.61) on self-lubricating "Morganite" carbon bearings for withstanding high temperature and corrosive atmospheres.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Watford By-pass, Herts.—Folder (PB. 847) illustrated with photomicrographs of various steels heat-treated in "Paragen" burner controlled atmosphere furnaces produced by the company.

Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, W.4.—Illustrated technical brochure describing the general characteristics and special features of standard patterns of recording instruments, fixed and portable, for most purposes.

Vacuums, Ltd., Aldridge Road, Birmingham, 22B.—Illustrated brochure on the "Bustler" vacuum cleaner.

Northern Industries, 199, Broughton Lane, Salford, 7, Lancs.—Trade price list of electrical equipment and accessories.

New Insulation Co., Ltd., Bristol Road, Gloucester.—Illustrated data brochure on "Permali," laminated densified wood, as insulating material for switchgear, rotating machines and traction equipment.

Muirhead & Co., Ltd., Elmers End, Beckenham, Kent.—Illustrated leaflet (B-528-D) describing the company's novel "Wigan" oscillator, which enables frequency to be selected by means of decade dials.

Laboratory Equipment

Not for many years has a priced catalogue of scientific apparatus for educational needs been compiled on the scale of that just issued by Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2. This volume (No. 52. AB of 616 pages with a comprehensive index) both illustrates and describes apparatus most likely to be required for lecture and laboratory use of students preparing for university and similar examinations in general science, including magnetism, electricity and electrochemistry. A feature of this volume is the experimental notes, with theory, method of use and specimen results. There is a section on atomic physics and electronics while the microid physical series of apparatus has been enlarged and there are several additions.

Scottish Office of D.S.I.R.

The Department of Scientific and Industrial Research has opened a Scottish office at 18, Melville Street, Edinburgh, to facilitate closer contact with Scotland. It will have a dual function—to encourage the prosecution of research by industry itself and to increase the effectiveness of the contribution which existing Government research establishments make to Scottish industry. Dr. H. Buckley will be in charge of the office. A graduate of Manchester University, he was on the staff of Toronto University before serving for twenty-five years on the staff of the National Physical Laboratory, where his special field of research was photometry and illumination.

Batti-Wallahs' Society

Mr. Edgar P. Angus is to be the guest of honour at the next luncheon of the Batti-Wallah's Society (Connaught Rooms, September 25th, 12.30 for 12.55 p.m.). Mr. Angus will deliver an address on "The Origin and Development of the Livery Guilds of the City of London."

Trade Announcements

Electrical Engineering Supplies (B'ham), Ltd., have now taken over more commodious premises at 92, Cheapside, Birmingham, 5 (telephone: Victoria 1971).

William R. Selwood has moved to larger premises at Bournemouth Road, Chandler's Ford, near Southampton (telephone: Chandler's Ford 2275-7), where an up-to-date depot has been provided for the sale of new and reconditioned plant.

World Power Conference

Sectional Meeting on Fuel Economy

AT the invitation of the Netherlands National Committee, the first sectional meeting of the World Power Conference to be held since the war was opened on September 2nd at the Hague and continued until September 10th. The subject considered was fuel economy under the three headings of production, distribution and utilization. The various papers were summarized by general reporters, who suggested topics of discussion in English or French.

Technical sessions began on Tuesday afternoon (September 2nd). Wednesday and Thursday were both taken up in the same way with the addition of discussions arranged by the Netherlands Institute for Electro-heating and Electro-chemistry. The two following days were set apart for visits to the State coal mines in the Province of Limburg, and on Sunday there was a non-technical excursion to Schipol airport, near Amsterdam. Further technical sessions were held on Monday and Tuesday. Of the four excursions arranged for Wednesday, the one to the Philips works at Eindhoven was of most directly electrical interest.

The British Coal Survey as a factor in fuel economy formed the subject of a paper by Dr. A. Parker and A. C. Maries, who gave examples of its value to all parties in correlating analytical data with performance of the many types at the Fuel Research Station and at industrial works. Electricity is generated in France in 250 coal-fired stations, P. Salmon stated in a second paper. During the occupation fuel consumption increased from 1·1 to 4 lb per kWh chiefly on account of bad quality and unsuitability, while drought since 1942 reduced the amount of hydro-electricity available. New hydro-electric stations are to be built which will increase production by 9,600 million kWh in five years. M. Demart (Belgium) deduced from Russian calculations that with gasification of coal, fuel costs at a central gas station would be 0·045 fr. per kWh as against 0·256 fr. for a modern steam station taking coal at 380 fr. (Belgian) a ton.

Experience of the British grid in wartime provided a theme for Sir Johnstone Wright, who collated the information available on the subject. The items have been presented to our readers from time to time, but the record here given indicates to those abroad the extent to which the grid contributed towards the complete dedication of human and material resources to the prosecution of the war by Great Britain. The grid, Sir Johnstone pointed out, offered much the same solution to problems of reconstruction, but the stress under which it now operated would in some ways become more severe before it lessened. The accompanying table indicates conditions during and immediately after the war compared with those prevailing previously.

GRID PLANT AND LOAD CONDITIONS IN MW SENT OUT

	Item	1938/39	1943/44	1944/45	1945/46
1	Maximum output capacity of plant installed, 20 years old and under	7,209	9,300	8,935	8,825
2	Percentage increase over 1938/39	—	29·0	23·9	22·4
3	Capacity of plant over 20 years old	229	690	1,365	1,702
4	Total output capacity	7,438	9,990	10,300	10,527
5	Percentage of plant over 20 years old	3·1	6·9	13·2	16·2
6	Capacity not available due to:				
	War damage	—	23	3	—
	Breakdown	271	775	713	652
	Overhaul	137	666	423	439
	Unsuitable fuel	—	152	209	237
	Circuit restrictions	—	122	55	16
	Other causes	—	256	294	352
7	Total capacity not available	408	1,994	1,697	1,696
8	Percentage capacity not available	5·6	20·0	16·5	16·1
9	Available output capacity (4) minus (7)	7,030	7,996	8,603	8,831
10	Simultaneous maximum demand on system	6,700	7,867	8,637	8,906
11	Percentage increase over 1938/39	—	17·4	28·9	32·8
12	Margin of spare plant at m.c.r. (9) minus (10)	+330	+129	−34	−75
13	Margin as percentage of (10)	+4·9	+1·6	−0·4	−0·8
14	Additional margin of spare plant obtained by overload, etc.	156	79	147	177
15	Frequency at time of (10) (cycles per sec.)	Normal	49·75	49·15	48·35

with other countries is expected to increase. The development of the French grid as regards relationship between voltage and power transmitted formed the subject of a study by M. Ailleret.

Conditions in China were dealt with by C. H. Chen and Y. S. Sun, who produced tables showing the kW installed and available (seldom the same figures) in larger cities in China and Manchuria. Work to be undertaken at once is the rehabilitation of 194,500 kW of generating plant and an extension of capacity by 197,000 kW at a cost of $10 million by purchases abroad. The next stage would be the construction of twelve networks calling for a further 1,100,000 kW within five years and entailing purchases abroad of at least $75 million.

Atomic Energy

Nuclear energy was dealt with in three papers. Professor J. D. Cockroft referred to the first controlled large-scale release in the University of Chicago on December 2nd, 1942, when Professor Fermi inserted into a graphite pile a critical amount of uranium metal, resulting in the generation of heat and emission of neutrons and gamma rays. Slow reactors operated through the fission of U235 and the emission of neutrons, which were slowed down in the graphite moderator. Roughly one pile generated the heat equivalent of 1,000 kW and burned 1 gram of nuclear fuel per day. Uranium rods were generally sheathed by aluminium and the uranium temperature was therefore limited to that of the safe creep stress of the latter, 300 to 400 deg C.

The pre-1939 annual production of uranium was about 1,000 tons, which at 25 per cent thermodynamic efficiency would lead to the generation of 42,000 million kWh, about the present annual usage in the United Kingdom. Capital costs and useful life of a power-producing pile could not at present be estimated, but with a pre-war cost of uranium of £2,000 per ton, a factor could be deduced which depended on the cost of metal making and chemical extractions and the number of metal cycles during its life; with a permissible fuel cost of 0·3d. per kWh, this factor would be about 30. More than one secondary fuel atom could be produced from each primary fuel atom burned, making possible the "breeding" of nuclear fuel from U238 and thorium to extend the available fuel stocks; the annual consumption of fissile material to supply world energy requirements of $4{\cdot}3 \times 10^{12}$ kWh would be 170 tons. This "breeding" was vital for world utilization of nuclear energy on a large scale, but its practicability was not yet certain.

That the costs of constructing and operating nuclear power plants could now be little more than intelligent guesses was also the contention of W. F. Davidson (United States), who referred to the estimate presented to the United Nations Atomic Energy Commission for a 75,000-kW installation with an annual output of 675 million kWh. Capital expenditure was given as $25 million, compared with $10 million for a coal-fired station of 25 per cent thermal efficiency burning coal of 13,500 B.Th.U. at $7 per ton. With total annual charges of $5,256,000 and $4,270,000 the costs per kWh sent out would be 0·80 cent per kWh for nuclear power and 0·65 cent for coal. Such plants might first find use where coal and oil were exceptionally expensive. In France the future of atomic energy, L. Kowarski submitted, would depend upon progress made mainly in Great Britain and the United States, but its economic utilization could be expected within the next few years.

The claim that, by inserting a gas turbine operating by air in the combustion-air system of a boiler plant, the overall efficiency could be increased by upwards of 10 per cent, with increase of output equal to that obtainable with a back-pressure set, was made by W. Karrer (Switzerland). Units were under construction or being designed in France, M. Roy stated, but he admitted that an experimental stage was essential in order to test reliability and power economy. How the economy of this type of engine depended on internal aerodynamic design was discussed by H. Roxbee Cox, A. R. Howell and A. G. Smith (Great Britain), who reproduced performance figures for engines designed for high pressure and for low pressure with heat exchange operating at 600 and 800 deg C, the latter being superior for stationary plant.

Boiler Practice

The more important aspects of the work of the Boiler Availability Committee have previously been summarized in the *Electrical Review*. These were brought together by Dr. H. E. Crossley in a paper on deposits on the external heating surfaces of boiler systems, in which after classifying these deposits and correlating them with the constituents of coals and combustion methods adopted he went on to discuss experiments conducted to obtain further information on the adhesion of bonded deposits, the reduction of sulphur trioxide and the volatilization of phosphorus. The most important factor for securing maximum availability was shown to be the method of cleaning used. Where practicable coals with more than 1·8 per cent of sulphur, 0·3 per cent of chlorine or 0·3 per cent of phosphorus should be reserved for pulverized-fuel firing.

Experience in the United States with the spreader type of stoker for boilers evaporating up to 250,000 lb per hour was described by R. L. Beers, who stressed the wider range of coals (from lignite of 6,700 B.Th.U. per lb with 40 per cent moisture to bituminous coal of 14,000 B.Th.U.) with which it would cope compared with other mechanical stokers. Its flexibility, he said, compared with that of oil. Heat release should not exceed 35,000 B.Th.U. per cu ft per hour. L. S. Wilcoxon discussed the

merits of the cyclone burner in connection with crushed low-grade coal, and gave particulars of performance over 2½ years of a 180,000 lb per hour installation at Chicago. Dr. Z. Ryska (Czechoslovakia) in another paper indicated improvements in boiler efficiencies obtainable through electronic control of combustion.

Statistics concerning the use of various fuels and their price levels, and the number of kWh consumed during the past few years by different industries in France, were given by P. Salmon. Deductions from results achieved on French railways were used by R. Dugas to emphasize the advantages of electric traction, even on an exclusively thermal basis, and to show that oil fuel gave only a limited improvement in steam-locomotive performance. In Sweden, T. Thelander showed, neither the large financial returns nor the saving in power that accrued from railway electrification were so important as the avoidance of a transport crisis due to inability of steam locomotives to cope with an increasing volume of traffic.

Problems relating to electricity generation in steel-works power stations using blast-furnace gas, which on account of its low calorific value presents difficulties of transmission, were dealt with by A. Evain (France). The development of high-frequency melting furnaces in Sweden at 40,000 cycles per sec was covered by L. Högel, who described the construction of the coils as similar in design to transformer coils; they were embedded in ceramic material and surrounded by packets of laminated transformer iron.

Figures were presented by G. Zimmerman which showed that in a Swedish hospital with little sterilization equipment the consumption worked out at 3·2 kWh per patient per day, with a diversity factor of 0·66 between demands. Experience in Norwegian dwellings, recounted by A. O. Hals, is that 3 kWh is needed to replace 1 kg of coke in water-heating plants for space heating, but the amount can be considerably reduced through automatic operation.

District Heating Schemes

District heating in Paris (18½ miles, to be extended to 26 miles) is supplied from a back-pressure plant and now saves 40,000 tons of coal and 224 tons of oil per annum (P. Houbin). In the reconstruction of Rotterdam, base-load heat is to be provided by the Schiehaven power station and peak demands by a few independent boiler stations (M.C. Hoenkamp). An annual saving of 30,000 tons of imported coal is expected to be made in Denmark through district heating (A. K. Bak). In Copenhagen, where both steam and hot water have been used for about twenty years, a new combined plant is to be erected and an existing one converted, so that about 400 million kWh will be generated by back-pressure plants and 160,000 tons of coal will be saved per annum. For house heating, steam is used only when a temperature is required higher than that of hot water at 158 to 239 deg F; high-pressure hot water at 266 to 356 deg F is believed to offer no advantages over the other two systems. Topping turbines were installed in the modernized Waterside stations of New York partly in order to supply the district heating system. When re-equipment is completed in 1950, 80 per cent of the steam will be supplied from turbine exhausts (W. F. Davidson and M. J. Steinberg).

Five further reports on Fuel Economy since 1939 have been published by the Central Office of the World Power Conference, 201-2, Grand Buildings, Trafalgar Square, W.C.2. These have been prepared by the national committees of Belgium, Hungary, Norway, Portugal and Switzerland. The first four are priced at 6d. each and the last at 1s.

Copper Production

Position of the Empire

THE British Commonwealth, according to the current issue of the *Bulletin* of the Copper Development Association, now leads the world in the production of copper, the annual output being approximately 700,000 short tons, compared with 604,000 tons produced by the United States. Consumption continues to increase. In 1946 it averaged 27,100 tons a month in this country, compared with 24,100 tons in 1945 and 21,500 tons in 1938. The heavy American demand cannot be satisfied by domestic production, with the result that competition for supplies outside the United States is severe. Statistics of production and consumption for the various world groups are given in the following table:—

Group	Short tons (thousands)		
	Reserves	Annual production	Annual requirements
United States ..	20,000	604	1,268
Latin America ..	28,100	600	10
British Empire ..	25,500	700	392
Europe (excluding Russia)	2,200	150	759
Russia	10,000	390	172
Africa (excluding British Empire) ..	7,360	160	(Small)
Far East (excluding British Empire) ..	500	50	210
TOTALS ..	93,660	2,654	2,811

The figures show that the United States and Europe are the chief buyers of copper, while Latin America and the British Empire are the only communities with any considerable production in excess of their annual requirements. At the present rate of production the reserves will be exhausted in thirty-five years. Lower grade ores, at present uneconomical to work, may have to be used, and much activity in prospecting for new deposits is in progress, especially in America. Unexplored reserves in Rhodesia are reported to be very extensive, and may be supplemented by deposits in South West Africa.

British Association

Scottish Water Power. Mine Mechanization.

IN a paper read before Section G (Engineering) of the British Association, J. Henderson (Ayrshire Electricity Board) traced the lines of Scottish water-power development with special reference to electrical problems. After referring to existing schemes, he said that during the next five to seven years the North of Scotland Hydro-Electric Board proposed to provide stations for fifteen schemes with an aggregate capacity of 820 MW, generating 2,300 million kWh. Experience with the Galloway scheme in the south-west showed that these should have sufficient plant capacity and storage combined to deal with 100 per cent peak loads. The largest sets took only from five to ten minutes to run up to full load compared with forty to fifty minutes in the case of a large steam set, and there were no stand-by losses.

Apart from the fifteen major schemes named in the paper there were others with a total output of 212 million kWh capable of meeting a firm demand of 58 MW. Schemes being developed in Perthshire accounted for 224 MW, and those further north for 240 MW, with 168 MW from Loch Sloy. For transmission in the more southerly schemes 132-kV double-circuit lines would, he believed, be suitable. As the power ultimately transferred from the north to central Scotland might exceed 500 MW, however, 220 or 264 kV would probably be necessary. High-speed protective gear was essential, and carrier-current protection enabled a fault to be cleared within five or six cycles.

Sir William Halcrow (section president) submitted that, as water was not a wasting asset, it was to be preferred for generating electricity to coal or oil, even at somewhat greater initial cost. Its cost would decrease, whereas no one knew what coal might cost.

Electric Coal-Cutters

In a paper on the mechanization of coal mines, F. S. Anderson said that 70 per cent of coal-cutting machines in Great Britain were electric (mainly powered by squirrel-cage motors) and that the proportion was steadily increasing at the expense of compressed air. Outstanding requirements of design were strength and minimum physical dimensions and flame-proof enclosure; a long-wall machine of 40 h.p. had been designed which was 12 in. high by 26 in. wide by 7 ft 10 in. long. A combined cutter and loader was a notable development. A disadvantage of the coal cutter was the large amount of dust it created, but a machine had been invented for clearing this automatically.

The examination of butt welds in pressure vessels was the subject of a paper by W. D. Garrick, who stated that X-ray tubes in general use in this country ranged from 60 to 1,000 kV, the latter able to penetrate 8-in. steel within an economic time, while one for 2,000 kV was about to be put into operation. The necessity for good technique was emphasized. Generally similar results could be obtained with gamma rays, but X-rays gave the better radiograph and better definition.

An account of investigations carried out with the aid of a scholarship award by the Institution of Electrical Engineers in regard to the resistance-capacitance oscillator was given by P. G. M. Dawe. The problem was treated theoretically with mathematical details and confirmed experimentally; its practical value lay in the design of keyed oscillators for telegraphy.

Welding Electrode Classification

TO facilitate selection of the most appropriate types for specific purposes, the coated electrodes made for arc welding mild steels by about a dozen British manufacturers have been classified. This joint action of the Arc Welding Section of the British Electrical and Allied Manufacturers' Association and the Institute of Welding will mean the code numbering of different makes so that the user will know which brands are similar. This simple method of identification should be particularly helpful to overseas buyers; the new classification includes a table showing how the British coding numbers compare with the American Welding Society's equivalents.

Classification is according to method of manufacturers, type of flux covering, position in which the electrode can be most satisfactorily used and recommended current conditions, meaning whether most suitable for high or low open-circuit voltage, a.c. or d.c., etc. All the mild steel electrodes classified are over 12 s.w.g. in size and conform to B.S.639 (Class A for hand operation). Incidentally, this specification is being revised so that in the near future that B.S. range will consist of one class only.

The code numbers show that, although there are many variations between different brands, almost all fall into three groups: for all-position general purposes, those complying with the B.E.A.M.A. " deèp penetration " test and those intended for deposition in flat and horizontal positions. They are all listed with their code numbers, sizes, makers' names and their type number or trade names in an explanatory booklet entitled " B.E.A.M.A.—I.O.W. British Electrode Classification," which is obtainable for 1s. from the B.E.A.M.A., 36, Kingsway, London, W.C.2.

ELECTRICITY SUPPLY

New Lighting Schemes. Higher Palestine Output.

Accrington.—ROAD LIGHTING.—The Ministry of Transport has consented to the Corporation's proceeding with a new main road lighting system, except the trunk road portion in the centre of the town, where the Corporation proposed to have incandescent lighting, but the Ministry has suggested that sodium lighting should be adopted.

Blackpool.—NO REBATE.—An attempt to obtain a rebate of 15 per cent on consumers' March accounts was defeated at the Town Council on September 3rd. A motion by Councillor Eaves secured only eight supporters. Councillor Eaves said that many consumers complained that their accounts were bigger in that quarter than previously, although they had used less electricity. Councillor R. Darbyshire regarded the motion as a slight on a well managed and efficient department, declaring that electricity meters registered correctly under load-shedding and Blackpool consumers had had a square deal. Alderman Nickson (Finance Committee chairman) said his Committee had considered a rebate but was unable to recommend it, simply because it had not got the money. He could see the time when they might have to consider an increase in the price of electricity.

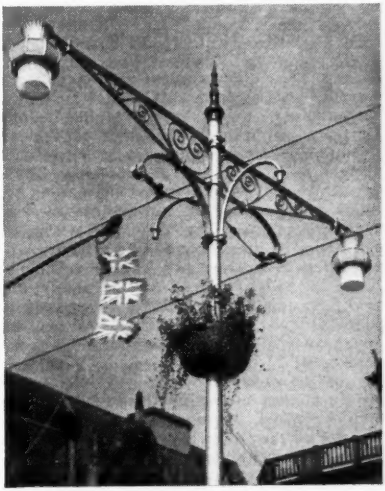
Bolton.—LOANS.—Application is to be made by the Electricity Committee for consent to borrow £5,385 for consumers' meters and for £32,000 for mains and services. Sanction has been obtained to a loan of £21,300 for buildings, mains and plant in connection with the supply of electricity in the south-east central district, and £28,730 for buildings, mains and plant to supply the Blenheim Road housing estate, the Tonge Moor district, and the Eskrick Street, Halliwell Road district.

Burnley.—JOINT GAS AND ELECTRICITY SHOWROOMS ?—The town clerk is to submit to the Electricity Committee a comprehensive report on a proposal for the merging of the gas and electricity showrooms.

Crayford (Kent).—LIGHTING SCHEME.—The Urban District Council is seeking sanction to borrow £25,920 in connection with a scheme for electric lighting for the district.

Dewsbury. — DISCHARGE LIGHTING. — The street lighting engineer is to submit an estimate and scheme to the Street Lighting Committee for lighting Leeds Road from Oval Lane to the borough boundary by mercury electric-discharge lamps.

Edinburgh. — FESTIVAL LIGHTING. — Eighty "Thistle" lanterns, two on each of forty columns, have been supplied by the General Electric Co., Ltd., for lighting Princes Street, Edinburgh. They form part of the scheme arranged for the Festival but will be retained as an integral part of the lighting of Princes Street. The optical system consists of the company's combination of dome and bowl refractor which, used with high-wattage



G.E.C. "Thistle" lanterns in Princes Street, Edinburgh

"Osram" filament lamps, gives accurate control of the light for main road lighting.

Port Glasgow.—DELAY IN SUPPLY TO ESTATES.—The Strathclyde Electricity Supply Co. has informed the Town Council that owing to the present shortages of materials the extra work necessary to make a supply of electricity available to the Boglestone and Bardrainney housing schemes cannot be completed within two years. In order to supply the site it will be necessary to carry out a major reinforcement of the e.h.v. network in the area, which will take two or three years. The town clerk has been instructed to place the whole matter before the Secretary of State for Scotland and request that he receive a deputation from the Housing Committee at an early date.

Overseas

Palestine.—RISING OUTPUT.—During 1946 the Palestine Electric Corporation, Ltd., generated over 288 million kWh, an increase of 15·3 per cent over the 1945 output. The maximum load was over 62,000 kW (against 55,000 kW). Sales rose by 17 per cent to 233 million kWh. As an indication of the rapid expansion, it may be mentioned that in

1940 only 93·9 million kWh was sold and the gross revenue then amounted to £P589,932 compared with £P2,127,451 last year. Consumers connected at December 31st last totalled 107,474, new connections during the year numbering 12,564. Transmission and distribution lines were extended during the year by 118 km, making 1,448 km of h.v. transmission and 1,358 km of l.v. distribution lines in operation. It is anticipated that a new 12,000-kW turbo-generator will be in commission in the Reading power house before the end of this year (another of 30,000 kW is on order), and that a 30,000-kW set will be put into commission in the Haifa power house during next year.

Electricity in West Midlands

Good Progress with New Walsall Station

IT is reported that excellent progress is being made with the new £7,500,000 Walsall generating station of the West Midlands Joint Electricity Authority. The first of the six 1·6 million gal per hr cooling towers has reached a height of 90 ft (it will eventually be 240 ft high). Two 30,000-kW turbo-alternators, five boilers and two cooling towers are planned to be in commission by September next year. The second section (scheduled to be ready a year later) comprises two similar sets, four boilers and two additional cooling towers, and the J.E.A. has been requested to make provision ultimately for 180,000 kW. Overall capital costs for the first and second sections average £41·22 per kW of installed plant. In view of the erection of the new station, the existing station at Walsall is now known as Birchills. Work is also proceeding on the extension of the Ocker Hill station (two 30,000-kW sets and five boilers) but progress has been generally slower than scheduled.

According to the annual report of the Joint Electricity Authority (clerk and manager, Mr. H. F. Carpenter) the total generating capacity of the J.E.A.'s stations is 288,530 kW (200,000 kW at Ironbridge). The maximum load (298,450 kW) exceeded the rated capacity but was less than in the previous year (305,850 kW). The Authority's own demand rose from 254,030 to 267,290 kW and in the coming winter it is estimated that 304,000 kW will be reached. There was a decrease in the kWh generated from 1,068·6 million to 1,065·8 million, and sales fell from 994·4 million to 988·3 million. The Central Board's programme for 1947 provides for an output of 1,145 million kWh from the Authority's selected stations, of which it is estimated that the J.E.A.'s own requirements will amount to 1,074·3 million kWh.

The Ironbridge station generated 888·5 million kWh last year, the maximum load being 226,600 kW, giving a load factor of 44·8 per cent, the same as in 1945. The yearly average thermal efficiency was 23·29 per cent, the highest since 1941, coal consumption amounting to 1·53 lb per kWh sent out. At the request of the C.E.B. a scheme has been approved to overcome difficulties caused by the formation of ice on the River Severn, the estimated cost being £40,000. The efficiency of the Wolverhampton station further improved during the year from 21·9 to 22·05 per cent; coal consumption fell from 1·69 to 1·68 lb per kWh.

In the Authority's Shropshire distribution area low-voltage supplies increased from 29·4 million to 36·4 million kWh, mainly because of the wider use of electricity for domestic and farm purposes, continued mechanization, and resumption of street lighting. High-voltage supplies advanced from 46·8 million to 48·9 million kWh. The average prices per kWh sold were, respectively, 1·57d. and 0·89d., compared with 1·62d. and 0·94d. in the preceding year.

Bulk supply revenue amounted to £2,503,677 (£2,322,896) and there was a surplus for the year (partly estimated) of £29,763 (£7,929). Coal and other fuel charges (including transport charges) increased from £1,478,316 to £1,501,909. The quantity of coal consumed was 733,683 tons, the average cost delivered to site being 38s. 6d. per ton compared with 37s. 9d. in 1945. Overall costs per kWh sold rose from 0·535d. to 0·576d. On local distribution account revenue totalled £425,180 (£383,915), and there was a surplus of £31,304 (£11,635).

The report for the year includes an appendix by the chief engineer (Mr. L. F. Jeffrey) dealing with the flooding of the River Severn in February, 1946.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers, which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

South Africa.—An English firm of engineering representatives and distributors wishes to get into touch with manufacturers of wrought iron electric light fittings for export to South Africa. (X.189.)

Southern Rhodesia.—A recently-established firm wishes to secure agencies for British electrical equipment and Diesel-electric generating sets. (X.190.)

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Strand Electric Holdings, Ltd., proposes to pay a dividend of 17½ per cent compared with 12½ per cent (including 2½ per cent bonus) last year. The accounts of the holding company cover the period July 11th, 1946, to April 30th, 1947, and in future the financial year will coincide with that of the operating company, the Strand Electric & Engineering Co., Ltd. Net profit of the operating company for the twelve months to April 30th last, after charging E.P.T. and profits tax but not income tax, was £31,575 (against £19,983 for 1945-46). A sum of £7,000 (£4,000 from profits and the remainder from tax surplus) is transferred to reserve. The gross dividend for the holding company is £22,245 (£16,569).

Scophony, Ltd.—An extra-ordinary general meeting was held last week following the demand of Dr. J. Sagall and a number of shareholders. Criticisms of the past and present policy of the board were replied to by the chairman (Sir Maurice Bonham Carter) and managing director (Mr. C. Collins) in the course of a stormy meeting lasting over two hours. A resolution proposing the removal from the board of these two directors was defeated by a large majority on a show of hands, and a poll was then demanded and taken, the results of which will be made known later.

Thorn Electrical Industries, Ltd.—At the annual meeting last week Mr. Jules Thorn (chairman and managing director) said that during the year under review the output of their lamp factories was increased despite all the difficulties. Their laboratories had been working for some years now on the development of fluorescent lamps and fittings; new lamp-making equipment, designed and built in their own workshops, should very considerably increase their production of these lamps some time next year. Lamp-cap production had been moved to their Enfield factory which was now helping to relieve a serious bottleneck in the industry. The Ferguson radio factory had produced a range of receivers and radiograms which had been very well received. Their company was also producing a television set. In the domestic apparatus field they were working on the development of new cleaners and other appliances.

They had moved part of their lamp production plant to South Wales to help the Government scheme for providing employment there, and had lately also commenced the production of radio and domestic appliances in Wales to provide jobs for ex-miners suffering from silicosis. After referring to the country's need for increased output, and the company's efforts to build up a first-class overseas selling organization, he said that they were going ahead undaunted by the present crisis and confidently hoping to be able to report even better results next year.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—At the annual meeting last week the chairman (Mr. A. J. Fippard) said that a return, in some measure, to more normal working conditions on the Kalgoorlie goldfield as labour was released from the Australian Forces resulted in an increased demand for power. Additional generating capacity was a matter of urgent importance. As the plant required could not have been put into commission until 1952 at the earliest, they looked to see if there was any alternative and as a result had been able to secure two 12,500-kW turbo-alternators manufactured by C. A. Parsons & Co. which were now being prepared for shipment to Australia. Additional boilers had been ordered from Babcock & Wilcox, Ltd., but there was difficulty as to the exact method of firing, for Australia, like many other countries, was suffering from an insufficiency of available coal. The proposals in hand entailed the erection of an entirely new building on the existing site, and it was necessary to increase the transmission and distribution voltage. An expenditure of over £200,000 was involved and when the plans were completed proposals would be submitted for raising the necessary capital.

East African Power & Lighting Co., Ltd.—Net revenue in 1946 amounted to £195,738 (against £184,663 for 1945). After providing £5,559 (£14,410) for taxation, £42,928 (£48,574) for depreciation, £40,000 (same) for general and development reserves, and £6,980 (nil) for preliminary development expenses written off, the ordinary dividend is maintained at 7 per cent for the year by a final payment of 4 per cent. The consolidated account shows net revenue of £237,940 (£236,016).

The report states that Government permission has not yet been received for the proposed capital issue, and the company's extensive development programme is being seriously impeded. Since the close of the year the Government of Uganda has intimated that it has decided to expropriate the company's licences and properties in the Protectorate and that the proposed Mujugali hydro-electric scheme cannot now be proceeded with. The company has been advised that negotiations will take place with a view to a mutually satisfactory compensation agreement.

Ransome & Marles Bearing Co., Ltd., besides maintaining the 20 per cent dividend for the year with a final payment of 12½ per cent, is distributing a special bonus of 5 per cent, less

tax, from accumulated overseas profits. The net profit, after taxation, for the year ended June 30th last was £152,830 (against £102,018) to which was added £53,129 from accumulated overseas profits and surplus reserves for previous year's taxation, making £205,959 altogether (against £127,371 for 1945-46, including E.P.T. recovery).

Wellman Smith Owen Engineering Corporation, Ltd.—Including £130,096 (against £124,787) held in reserve on contracts completed in previous periods now in excess of requirements, the trading profit for the year ended March 31st last amounted to £188,551 (against £173,597). After allowing £150,000 (£146,338) for taxation the net profit was £38,551 (£27,259). Besides again allocating £10,000 to general reserve an additional £10,000 is placed to depreciation reserve. The final dividend of 7½ per cent makes 12½ per cent for the year (same) and £48,360 (£47,172) is carried forward.

The Dubilier Condenser Co. (1925), Ltd., after setting aside £15,000 (£21,000) for income tax, made a net profit of £22,578 in the year ended March 31st last (against £29,822 in 1945-46). The ordinary dividend remains at 20 per cent and £32,687 (£24,076) is carried forward.

Oldham & Son, Ltd., have declared a final dividend of 30 per cent, making 60 per cent for the year as forecast when the shares were introduced to the market last March. Preliminary figures give the net profit before tax as £159,177 compared with £165,370 for 1945-46.

Murex, Ltd., is proposing to raise its capital from £1,050,000 to £1,650,000 (£1,450,000 issued). At a meeting to be held on September 29th, resolutions will be submitted for the creation of 400,000 4 per cent cumulative redeemable preference shares of £1 each. These will be offered to the present holders of the company's ordinary and 7 per cent preference shares at par.

The London Electrical & General Trust, Ltd., has declared a final dividend of 4 per cent, maintaining the year's distribution at 6 per cent.

The South London Electric Supply Corporation, Ltd., announces an unchanged interim dividend of 3 per cent.

The County of London Electric Supply Co., Ltd., is paying an interim dividend of 3 per cent, the same as last year.

The Bournemouth & Poole Electricity Supply Co., Ltd., is maintaining its interim dividend at 5 per cent.

A. Reyrolle & Co., Ltd., are paying an unchanged interim dividend of 5 per cent.

Davis & Timmins, Ltd., are making an interim distribution of 10 per cent (same).

Walsall Conduits, Ltd., is repeating its interim dividend at 20 per cent.

British Ropes, Ltd., has declared an interim dividend of 5 per cent, the same as last year.

New Companies

Thos. Handley & Co., Ltd.—Registered July 31st. Capital, £2,000. Manufacturers of electrical equipment. Directors: T. Handley and Doris M. Yeomans. Regd. office: 7a, High Road, Chadwell Heath.

C.M.C. (Switchmatic), Ltd.—Registered August 29th. Capital, £500. To acquire the business of manufacturers of the "Switchmatic" remote control systems carried on by L. J. J. Henry and R. E. Ireland at 5, Southview Road, Southwick, Sussex. Directors: L. J. J. Henry, 66, Rutland Gardens, Hove; R. E. Ireland and N. J. Crouch.

R.A. Bartier, Ltd.—Registered August 30th. Capital, £1,000. Manufacturers of, and dealers in, apparatus for use in connection with the general distribution, accumulation and employment of electricity, gas, heating, etc. R. A. Bartier is permanent director. Regd. office: 318, King Street, Hammersmith, W.6.

London Bridge Electric Co., Ltd.—Registered September 1st. Capital, £500. Electrical engineers and contractors, manufacturers, repairers and dealers in electrical and mechanical equipment, etc. Directors: O. H. Groves, W. G. Jackson and H. W. Hornby. Regd. office: 3, London Bridge Street, S.E.1.

Increases of Capital

Lamp Caps, Ltd.—Increased by £100,000 beyond the registered capital of £50,000. To July 4th, 1947, 50,000 shares of £1 had been issued, of which the General Electric Co., Ltd., held 24,798, and the British Thomson-Houston Co., Ltd., 24,800 shares.

Troughton & Young, Ltd.—Increased by £200,000 beyond the registered capital of £50,000.

Cables & Plastics, Ltd.—Increased by £80,000 beyond the registered capital of £2,000.

Car Electrical Services (Faulkner), Ltd.—Increased by £8,500 beyond the registered capital of £1,500.

Bankruptcies

E. Marrow, 123, King Street, Knutsford, Ches., electrical and radio engineer.—Receiving order made August 28th on debtor's own petition.

J. F. Bradley, 39, Mackenzie Road, Holloway, London, electrical engineer.—First meeting September 17th; public examination November 6th; both at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. Leivers, Victoria Radio Stores, 94, Victoria Road, Kirkby-in-Ashfield, Notts, radio electrical engineer.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released August 29th 1947.

STOCKS AND SHARES

STOCK Exchange markets have been passing through a period of minor crisis on their own account. Violent falls in the gilt-edged sections were followed by equally sharp declines in the prices of industrial shares. Judged by the extent of the falls, forced selling was in progress, and, while this continued, what little support came in from courageous buyers had no effect in staying the slump. As soon, however, as the forced selling was over, a considerable rally occurred, putting a brighter complexion upon quotations in most departments. Amongst the few sections that suffered comparatively little was that for Home electricity supply shares, These have the advantage of support from buyers who look upon a purchase of the shares as a cheap way of obtaining an interest in British Government security.

In the active markets which have obtained throughout the greater part of the current twelvemonth, it has been fairly easy to deal in lines of shares at reasonably close prices, but, under slump conditions, the would-be seller finds it a great deal more difficult to get on—in Stock Exchange phrase—than the buyer does. The majority of clients have recently been sellers and they, not unnaturally, feel annoyed upon finding that when they wish to sell there is a market only in a limited number of shares.

Decline and Falls

Falls have been distributed with impartiality over a wide section of the industrial market. Weakness in the radio group is reflected in E. K. Cole, 15s., and Decca, 35s. In the telephone group, Automatics fell to 53s. Electric Constructions, 45s., General Cables, 35s., Lancashire Dynamo, 97s. 6d., Westinghouse Brake 61s. 3d., Tube Investments, 5 11/16, Telegraph Construction, 41s. 3d., and Murex, 77s. 6d., are amongst the many which have gone back still further after their previous declines. British Insulated Callender's, 36s. 3d., General Electric, 83s. 9d., Associated Electrical, 72s. 6d., Johnson & Phillips, 61s. 3d., and Aron 52s. 6d., must be added to those in which the week's work brought about depression. These prices are not the lowest touched during the past week. Deccas, for instance, were 30s. at one time, and General Electrics, £4. Hopes of a settlement of the coal strike helped to bring about substantial recoveries from the worst.

Electricity Supply Dividends

Several of the Home electricity supply companies have declared their interim dividends in respect of the six months recently ended. The rates in each case have been the same as those of a year ago; this was practically a foregone conclusion. What the final dividends will be must depend upon the vesting date, which, so far, has not been fixed. The companies will pay the same rates as before, up to that date. The Government has so much on hand that it will probably be in no great hurry to complete the nationalization scheme. Holders of the shares in the companies concerned may look forward to a probable repetition, six months hence, of the dividends which they received last March and April.

Cable & Wireless

Cable & Wireless stocks have both come down in sympathy with the flatness that prevailed elsewhere, the ordinary being 3½ lower, at 147½, and the preference 2½ points down, at 108½. No fresh development is likely to occur until the new year, when the arbitration tribunal will begin its sittings with a view to deciding the price which the Government shall pay for the purchase of the operating company. This is likely to take weeks to determine. When a settlement is reached on this head, it will remain for the stockholders of Cable & Wireless (Holding) to make up their minds as to whether the combine shall continue as a trust or similar company, or whether it shall be wound up and the assets distributed. Therefore, months may be expected to elapse before anything definite is done in the direction of settling the affairs of the company.

Overseas

Events in India are having a natural repercussion upon prices of Indian industrials. This is apparent mostly in Calcutta Trams, which at 30s. 6d. (after 27s. 6d.) are 4s. 6d. down on the week, while Calcutta Electrics, 40s., Cawnpore, 50s., and Madras, 41s. 6d., are all easier. Amongst other overseas issues, Tokyo "sixes" at 52½ have shed 5½ points. The slide in communication stocks continues, Anglo-American Telegraph preferred stock at 122½ and the deferred at 25, being down by 5 and 2½ points respectively.

The National Credit

The fall in prices from the levels attained no longer back than a couple of months would undoubtedly attract money into the shares were it not for lack of confidence in regard to the intentions of the Government. Mr. Bevin's speech of last week had the effect of stiffening industrial markets, though it was generally admitted that the Foreign Secretary—while more definite than his predecessors—did little to outline practical steps whereby the economic crisis can be met. The Government's policy of keeping the national credit at 2½ per cent is considered wrong and 3 per cent is the answer of the investor to financial problems of the moment. A 3 per cent yield from gilt-edged securities implies 3½ per cent to 4 per cent on sound preference, and 4½ to 5 per cent on industrial ordinary shares. Towards these levels, Stock Exchange prices have lately been drifting.

Temporary or Defective?

Points Raised in a Recent Legal Case

By F. E. Sugden,
A.C.I.S., Barrister-at-Law

AN electrical case which recently occupied the attention of the Court involved matters of some importance to electrical contractors. In this case there was a long-standing dispute as to whether some motors in a factory had been defectively installed or whether the installation should be regarded as of a temporary nature.

The defendants declined to pay the account for three main reasons:—First, that the work had not been done quickly enough; secondly, that the cable connecting the motors was not properly installed; and thirdly, the cable in the factory was not sealed at the ends, the lead sheath was fractured and three or four motors were connected to a single switch at the distribution board and not separately switched as they should have been. They also complained that, instead of the v.i.r. cable being cleated, it was slung on the girders in a temporary way and live cable was lying about on the ground in sawdust.

The plaintiffs contended that the loose cables were not there when they made the installation and further that they were taken off the job before they had time to make the temporary installation of a permanent nature. It was considered that to put some or all of the cables either in wooden casing or metal tubing would have added considerably to the cost of the job. It was stated that the work in question was subsequently made permanent by the electricity supply authority.

Speedy Work Required

The time factor played an important part in this case, because the defendants were moving their " factory " (a sawmill) from one district to another and they wanted the installations carried out as quickly as possible.

Apparently the defendants did not complain about the installation until they were considering payment and the factory had been working for six months and then it was contended that the installation would not pass the factory inspector who is concerned mainly with the safety of employees.

There was also another interesting point in this case: in the first instance the plaintiffs sub-contracted the work to a minor firm and claimed a percentage profit on the bill submitted to the plaintiffs who in turn submitted the account to the defendants with this additional charge. The defendants argued that they should not pay this because the plaintiffs did not carry out the work. The plaintiffs contended as they had supervised the work they were entitled to remuneration. On this point the Judge found that a certain percentage should be allowed for that supervision.

Regarding the slinging of the v.i.r. cable over a girder instead of being cleated, the Judge came to the conclusion that, as the work was of a temporary nature, there was no objection to it.

As regarded the connection of several motors to one switch, the Judge decided that as he had found, as a fact, that the work was of a temporary nature there was no objection to having one switch to about every three motors, provided that each motor subsequently had its own switch. This also applied to the fuse boxes, the plaintiffs having stated that their intention was to fit a switch and fuse box for each motor, if they had the opportunity to do so.

Position of Wiring

An expert had stated that the v.i.r. wiring should have been in conduit and not slung over the girder, but, he also admitted that it was a good installation if the cable was tied by string or other similar material to the girder, provided it was deemed to be of a temporary nature, which was the case here. On the other hand it is obvious that cables should not have been left lying in sawdust on the floor for any future employee to come into contact with, even though it was a temporary installation. It was not detrimental to the work because they contended that it would have been perfect if the cable had not been fractured but that in itself would not be a sufficient reason for the defendants to refuse to pay the cost of the installation.

Unfortunately in this case, when the job was first commenced the defendants did not know exactly where they wanted the motors placed. This was decided as time went on and in itself further delayed the work.

The Judge found in favour of the plaintiffs because the installation was to be deemed o

a temporary nature. If there were any defects they were due not to the plaintiffs' action but to the defendants or their employees, or some persons other than the plaintiffs.

There is frequently a tendency for the customer to get an electrical contractor to cut his price down as much as possible and in consequence many things have to be eliminated, although some of these "extras" are necessary to make the job safer.

The contractor is strongly advised to impress upon his customer that where these so-called "trimmings" are purposely omitted the job should be deemed to be of a temporary nature otherwise it might result in High Court litigation, because the dividing line between temporary work and bad workmanship is so fine. The plaintiffs who sue for their money must prove to the Judge that the work is not bad but of a temporary nature. If the customer declines to pay for these extras in order to make the job safe for future employees, the contractor must, of necessity, endeavour to make the job as safe as possible without them.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1939

H. HUGHES & Son, Ltd., D. O. Sproule and A. J. Hughes.—"Directional sound wave apparatus." 9080. March 22nd, 1939. (591533.)

1941

Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—"Oscillograph methods of measuring short periods of time." 15113. August 3rd, 1940. (591623.)

1942

P. Malsallez.—"Electrical apparatus for measuring dimensions." 4360. January 24th, 1941. (591490.)

British Thomson-Houston Co., Ltd.—"Electric control systems employing light sensitive means, particularly suitable for lateral register correction of moving material." 14533. October 16th, 1941. (591578.)

1943

Sperry Gyroscope Co., Inc.—"Ultra-high-frequency antenna apparatus for directionally radiating and/or receiving electro-magnetic waves." 5075. March 31st, 1942. (591625.)

Ferranti, Ltd., L. Atkinson and A. L. Chilcot.—"Impulse-actuated electronic relay tubes and apparatus for use therewith." 12444. July 31st, 1943. (591445.)

1944

British Thomson-Houston Co., Ltd.—"Luminescent materials." 3257. February 25th, 1943. (591450.) "Synthetic rubber compositions." 5844. April 1st, 1943. (591627.)

M-O Valve Co., Ltd., R. H. Craig and W. H. Medcalf.—"Machines for making grids of the kind used in valves." 3360. February 23rd, 1944. (591451.)

British Thomson-Houston Co., Ltd., R. S. Wells and J. Moir.—"Device for the conversion of mechanical movements into electric current variations." 5907. March 30th, 1944. (591452.)

Robertshaw Thermostat Co.—"Control systems involving electromagnetic switches which control motors." 6740. May 31st, 1943. (591582.) "Automatic temperature-controlling devices." 6741. August 6th, 1943. (591583.)

Western Electric Co., Inc.—"Telephone substation circuits of the anti-side-tone type." 10687. October 24th, 1942. (591495.)

Farnsworth Television & Radio Corporation.—"Moisture indicator." 17525. April 24th, 1943. (591542.)

Standard Telephones & Cables, Ltd., and J. M. Keenan.—"Insulation of electric wire and cable by extrusion." 18279. September 25th, 1944. (591590.)

Automatic Telephone & Electric Co., Ltd., and L. M. Simpson.—"Electrical signalling systems." 20313. October 20th, 1944. (591462.)

Muirhead & Co., Ltd., and W. C. Lister.—"Rotatable electric switches." 22854. November 17th, 1944. (591465.)

General Motors Corporation.—"Control device for electric motors." 23909. November 6th, 1943. (591634.)

Carlisle Electrical Manufacturing Co., Ltd., and H. V. Carlisle.—"Electric heating apparatus." 24551. December 8th, 1944. (591466.)

D. M. Robinson, A. T. Starr and J. B. Adams.—"Coupling devices for ultra-high-frequency apparatus." 25422. December 18th, 1944. (591597.)

1945

W. Ross.—"Radio direction finders." 1622. January 19th, 1945. (591637.)

Aktiebolaget Nordiska Armaturfabrikerna.—"Driving motors for gyroscopes." 1924. January 8th, 1944. (591598.)

A. H. Stevens (Mycalex Corporation of America).—" Electrical insulating compositions." 3112. February 7th, 1945. (591551.)

E. Mestitz.—" Combined switches and electric couplings." 4612. February 19th, 1946. (591638.)

Marconi's Wireless Telegraph Co., Ltd.—" Methods of making luminescent screens." 5619. February 27th, 1942. (591506.)

W. S. Sholl.—" Impulse type turbines." 6819. March 19th, 1945. (591555.)

E. Mackereth.—" Mounting brackets for transformer." 7525. March 26th, 1945. (591557.)

Babcock & Wilcox, Ltd., and R. H. Evans.—" Heat exchangers." 7973. March 29th, 1945. (591602.)

Allmanna Svenska Elektriska Aktiebolaget.—" Compressed air valves for operating electric circuit breakers." 8412. April 24th, 1944. (591604.)

British Thomson-Houston Co., Ltd.—" Temperature responsive devices." 8586. April 8th, 1944. (591605.) " Electric relays." 11728. May 10th, 1944. (591480.) " Diamond tools and methods of making the same." 11729. May 10th, 1944. (591481.)

G. Haim.—" Electrodes for under-water welding." 8760. April 9th, 1945. (591640.)

Carrier Engineering Co., Ltd.—" Apparatus for defrosting for use in cold diffusers or the like." 9732. May 25th, 1944. (591606.)

L. Lempert and R. S. Hartley.—" Refrigerators and cooking stoves or ovens." 10535. April 26th, 1945. (Cognate application 12768/45.) (591512.)

British Thomson-Houston Co., Ltd., and T. H. Woodfield.—" Cutting appliances." 11727. May 10th, 1945. (591559.)

Standard Telephones & Cables, Ltd.—" Electric selector switches." 11866. July 29th, 1944. (591523.) " Turbo generator." 11867. June 7th, 1944. (591524.)

Crompton Parkinson, Ltd., A. L. Randall, F. J. Templeton and F. Seaborne.—" Chokes for use in lighting installations comprising one or more electric discharge lamps or tubes." 11898. May 11th, 1945. (591527.)

Siemens Bros. & Co., Ltd., and L. S. Crutch.—" Electric signalling systems." 11915. May 11th, 1945. (591561.)

St. Helens Cable & Rubber Co., Ltd., and D. Burrett.—" Apparatus for distributing powdered material over a travelling surface." 11970. May 12th, 1945. (591484.)

W. Canning & Co., Ltd., and H. C. Clements.—" Means for suspending anodes in electrolytic baths." 12020. May 14th, 1945. (591574.)

Standard Telephones & Cables, Ltd., and A. A. New.—" Electric cables." 12221. May 15th, 1945. (591647.)

Standard Telephones & Cables, Ltd., and W. R. Moscrip.—" Manufacture of stems for electron discharge devices and the like." 12222. May 15th, 1945. (591648.)

Ericsson Telephones, Ltd., and L. S. Distin.—" Electric control systems." 12248. May 16th 1945. (591651.)

E. P. Elston.—" Swivelling electrical connectors." 12270. May 16th, 1945. (591652.)

Automatic Telephone & Electric Co., Ltd., and G. T. Baker.—" Electro-magnetic relays." 12279. May 16th, 1945. (591655.)

S. H. Hannah.—" Low and medium voltage three-phase electric motors." 12326. May 16th, 1945. (591658.)

Central Tool & Equipment Co., Ltd., and D. W. Samuel.—" Portable high speed electric grinding, polishing and drilling machines." 12355. May 16th, 1945. (591661.)

J. B. Pierce Foundation.—" Electric wiring conduits." 12429. August 2nd, 1944. (591664.)

Hazeltine Corporation.—" High-frequency tuning device." 12815. June 27th, 1944. (591486.)

Sperry Gyroscope Co., Inc.—" Impedance transformers for waveguides." 24158. March 31st, 1942. (Divided out of 591625.) (591667.)

1946

Standard Telephones & Cables, Ltd.—" Selector switches such as are used in automatic telephone systems." 13685. July 29th, 1944. (Divided out of 591523.) (591532.)

Amended Specification

563529. Electronic Laboratories, Inc.—" Electrical inverter systems."

Trade Marks

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month from September 3rd:—

Design (seated female figure). No. 639,567, Class 7. Hair-waving machines and parts not included in other classes. No. 639,566, Class 11. Hair-drying machines and parts not included in other classes.—Eugène, Ltd., Edgware Road, Hendon, N.W.9.

ELOX (design). No. 631,577, Class 7. Electrically-operated machines for removing hard metal and parts thereof not included in other classes.—Elox Corporation, Detroit, Mich., U.S.A. Address for service:—c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.

DYNAMINA. No. 648,931, Class 9. Rotary electric convertors.—Hoover, Ltd., Perivale, Greenford, Middlesex.

CRALEK. No. 649,521, Class 9. Electrical apparatus and instruments included in Class 9.—W. R. Craig, trading as W. R. Craig & Co., 32, Palmerston Road, Acton, W.3.

MARANDA. No. 645,114, Class 11. Heating, lighting, cooking, drying, refrigerating and deodorizing apparatus and parts (not included in other classes) of such goods.—M.R.D.A., Ltd., Maranda House, Binney Street, Oxford Street, W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bristol.—September 30th. Public Works Maintenance Committee. Installation of self-starting synchronous electric clock control for street lighting purposes. (September 5th.)

Bury.—September 22nd. Borough Council. Installation of lighting equipment in the public library. (See this issue.)

Edinburgh.—September 30th. Electricity Department. P.i. cables for twelve months. (September 5th.)

Flint.—September 15th. Borough Council. Electrical installation in 30 houses, Wern estate, Bagilt. (September 5th.)

Manchester.—September 22nd. Electricity Department. Accessories for use with domestic appliances for twelve months. (September 5th.)

Newbiggin.—September 24th. U.D.C. Electrical installation in twelve bungalows and six houses at Long Park. Surveyor, Urban Council Offices.

New Zealand.—October 31st. South Canterbury Power Board, Timaru. Peak load control and metering gear.

November 25th. Hydro-Electric Department. Two 11,000-kVA transformer banks for Cobb River power station (Contract 42). Traders' Committee, Wellington.

Plympton St. Mary.—October 6th. R.D.C. Electricity Department. Underground cables, with pilot and telephone cable; switchboards and transformers. (August 29th.)

Poplar.—October 9th. Borough Council. Nine 500-kVA transformers, 6,000/415-V. (September 5th.)

Portsmouth.—September 30th. Electricity Service. Transformers. (August 22nd.)

Silsden.—September 30th. U.D.C. Gas Department. Electric lift at Gas Works. (See this issue.)

South Africa.—November 11th. Pretoria City Council. Piping and circulating water pumps and equipment for power station "B". (August 29th.)

Southport.—September 27th. Corporation. Transformers. (See this issue.)

Wakefield. — September 27th. R.D.C. Electrical installation in the Council Offices. Surveyor, Council Offices, 18, St. John's North.

Winchester.—September 27th. Corporation. Complete central-heating system for the Guildhall. (September 5th.)

Orders Placed

Cheltenham.—Estate Management Sub-Committee. Recommended. Electrical installations in 26 houses (£584).—R. E. & C. Marshall.

Glasgow.—Clyde Navigation Trust. Accepted. Electrification and improvement scheme for the south quay area of Princes Dock:—Electric level-luffing cranes(£119,622.)—Cowans, Sheldon & Co. Interlocking switch plug boxes (£4,225).—Johnson & Phillips. Rectifier plant (£4,050).—Hackbridge & Hewittic Electric Co.

Sheffield.—Corporation. Accepted. Further supply of equipment in connection with modifications to existing switchgear, for the primary distribution system (£13,370).—A. Reyrolle & Co. 11-kV three-phase, 150-MVA switchgear, for the Neepsend generating station (£8,460).—Switchgear & Cowans.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ambrosden.—Houses (500), for the War Department; G. R. Hutton, county architect, Oxford.

Ampthill.—Aluminium permanent bungalows (47), Flitwick and Westoning; surveyor, Rural Council Offices, Flitwick.

Bacup.—Houses (46), Huttock End; borough engineer.

Basingstoke.—Dwellings (54), Sherborne St. John; Wallis & Smith, architects to T.C.; 6a, London Street.

Belfast.—Houses, Glenard estate (134), Edenvale estate (69); education architect, Room 15, Floor "E," College of Technology.

Bermondsey.—Rebuilding and extension of factory; Associated Biscuit Manufacturers, Ltd., Keetons Road, S.E.1.

Bideford.—Works; British Rola, Ltd., Barry Works, Summer Road, Thames Ditton, Surrey.

Billingham-on-Tees.—Workshop and offices, Frederic Street; Smith & Coates, constructional engineers, Stockton-on-Tees.

Birmingham.—School, Mapledene Road,Sheldon (£117,200); city architect, Council House.

Blaby.—Houses (146); clerk to R.D.C., Council Offices, Narborough, near Leicester.

Bridgwater.—Permanent aluminium bungalows (60), Moss estate, Bath Road; borough engineer.

Bury.—Houses (48); borough surveyor.

Chippenham.—Aluminium houses (100), Hungerdown Lane, Plantation Road, and another site; borough surveyor.

Clare (Suffolk).—Houses (64), Clare, Great Thurlow, Little Thurlow, Great Bradley, Hundon and Hungerdown Lane; surveyor, R.D.C. offices.

Corsham.—Factory, Potley Lane; Bath & Portland Stone Firms, Kingston Buildings, Bath.

Coventry.—Works, Torrington Avenue, for Associated Cycle Mfrs. (£250,000); W. T. Whittall & Sons, Ltd., builders, 132, Lancaster Street, Birmingham, 4.

Miners' houses (300), Binley; city architect, 1a, Warwick Row.

Darlington.—Development, Victoria Road, including the erection of corn exchange; borough architect.

Establishment of brickworks, Neasham Road, for the Crossley and South Bank Brick Co., Ltd.

Factory, McMullen Road area, for the Darlington Pure Ice and Cold Storage Co., Ltd., Feethams.

Edinburgh.—Alterations, for Lorimer & Clark, Ltd., Caledonian Brewery (£6,000).

Houses (184), in connection with Inch development scheme; city architect.

Edmonton.—Rebuilding three factories for the Ever Ready Co. (Gt. Britain), Ltd., Angel Road; Stirrup & Reddick, 5, Buckingham Place, S.W.1.

Elstree.—Houses (104), Boreham Wood, for R.D.C.; John Laing & Son, Ltd., Mill Hill, N.W.7.

Enfield.—Works and office extensions, Alexandra Road; C. E. Owen Ward, 1a, Aldermans Hill, Palmers Green, N. 13.

Gosforth.—Primary school (560 places); county architect, County Hall, Newcastle-on-Tyne.

Harpenden.—Reconstruction of pumping station; clerk to U.D.C., Harpenden Hall.

Hessle.—Semi-detached dwellings (78), Hull Road, for Haltemprice U.D.C.; A. B. Glasspool, clerk, Anlaby House, Anlaby.

Hull.—Houses (20) for aged persons, First Avenue, for T.C. (£16,598); Robinson & Sawdon, builders, 95, Alexandra Road,

Ilford.—Works extensions for Bradley & Burch (Ilford), Ltd., Sunnyside Road; Granville F. Seigerts, 7, Electric Parade, Seven Kings.

Keswick.—Houses (24) for the U.D.C.; Keswick Building Trades Association, contractors.

Leek.—Pit-head baths for Hem Heath Colliery Miners' Welfare Commission (£47,540); Cooper Bros. & John Clayton, Ltd., builders, Catherine Street, Macclesfield.

Liverpool.—Extensions, Blackmoor Park Primary School (8,000) for E.C.; city architect, Blackburn Chambers.

Middlesbrough.—Church and hall, College Road, for the Rev. T. A. Nolan; T. A. Crawford architect, 80, Borough Road.

Nurses' quarters (24 beds) at maternity hospital; borough engineer.

Morecambe.—Nurses' home extensions, Queen Victoria Hospital; W. J. Morley & Son, architects, 269, Swan Arcade, Bradford.

Morpeth.—Airey type houses at Hepscott and Lynemouth; R.D.C. surveyor.

Four blocks, St. Andrew's Colony, Northgate (£100,000); county architect, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Butter factory, Quayside, for the C.W.S.; C.W.S. Architects' Dept., 90, Westmoreland Road.

North Riding.—Primary school, Barrowcliff; county architect, County Hall, Northallerton.

Northumberland.—Police stations at Hexham and Bedlington, and police houses (55); county architect, County Hall, Newcastle-on-Tyne.

Nottingham.—Rebuilding printing works, Station Road, for Boots Pure Drug Co. (£750,000); Gilbert Ash, Ltd., 2, Stanhope Gate, London, W.1.

Penrith.—Secondary school; Cumberland county architect, 4, Alfred Street North, Carlisle.

Redditch.—Factory, Arthur Street, for Allan Lewin, Ltd., Mayfields, Mount Pleasant.

Rhondda.—Factory extensions, for Alfred Polikoff (Wales), Ltd., clothing manufacturers; Sir Alexander Gibb & Partners, Queen Anne's Lodge, London, S.W.1.

Rochdale.—Assembly works and offices, Heywood Road, for T.N.R. Engineering Co., Ltd., Castleton.

St. Helens.—Three factories (250,000 sq ft floor space), Parr; Geo. Moss & Son, Ltd., Back St. Helens Road, Leigh.

Sherburn-in-Elmet.—Works extensions, Wellington Street, for W. & T. Avery, Ltd.; W. Nicholson & Sons (Leeds), Ltd., Prospect Mills, Hunslet.

Skegness.—Houses (58), Church Lane; clerk to U.D.C., Town Hall.

Stratford-on-Avon.—Houses (38), Kineton; surveyor, R.D.C. Offices, 11, Guild Street.

Sunderland.—Works, for the Wearside Pottery Co., Alfred Street, Millfield.

Swansea.—Enlargement of brewery, for Wm. Hancock & Co., Ltd., The Brewery, Cardiff.

Tattingstone.—Nurses' home and alterations, St. Mary's Institution; A. J. Symcox, County Hall, Ipswich.

Torquay.—Extensions, Torbay Hospital: Powell & Powell, architects, 3, Lower Terrace.

Dairy and depot, Hele Street, for Devonshire Dairies, Ltd.; Malcolm C. Broad, Central Buildings, North Street, Guildford.

Wanstead.—Housing estate, Snaresbrook Road, for T.C.; Tooley & Foster, Midland Bank Chambers, Buckhurst Hill.